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Nuclear Science Abstracts

Vol. 2 No. 3
February 15, 1949

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Technical Information Division, Oak Ridge, Tennessee
AEC, Oak Ridge, Tenn., 11-17-49--125-A14837

Printed in U.S.A.
PRICE 25 CENTS

NUCLEAR SCIENCE ABSTRACTS

These abstracts are prepared from Atomic Energy Commission documents which are not classified for security reasons, and from articles appearing in the published literature, both domestic and foreign, pertaining to atomic energy.

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NUCLEAR SCIENCE ABSTRACTS

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ABSORPTION AND SCATTERING OF RADIATION

689 New Alloy 50% Heavier than Lead Serves Many Purposes Inco 22 No.3 14 and 29 (1948)

A new alloy has been developed by General Electric as a screen against rays from radium or x-ray machines. The alloy, known as G-E Hevimet, is produced by powder metallurgy, is machinable and has high strength. A table giving composition and properties is included.

690 On the Angular Distribution of Electronic Pairs Produced by γ-Rays of ThC″ (K Voprosu ob Uglovom Raspredelenii Par, Obrazovannykh γ-Luchami ThC″) by L V Groshev and I M Frank Zhur Eksptl noĭ i Teoret Fiz 17 121-123 (1947) (In Russian)

In a previous work (Doklady Akad Nauk SSSR 20 273 (1938); also Groshev, J Phys SSSR 5 115 (1941)) the authors found that the angular distribution of pairs generated in gases by gamma rays from ThC″ depends on the atomic number Z. This result agrees with the theoretical findings of Jaeger and Hulme (Nature 142 573 (1938)). However, Dzhelepov and Vlasov (Zhur Eksptl noĭ i Teoret Fiz 15 685 (1945)) observed no such correlation while experimenting with pairs produced by the same rays in thin Al and Pb targets. The present authors contend that the magnitude measured by their opponents was essentially different from that studied by themselves.

Using a Wilson chamber, the authors measured the angles: (1) θ_+ between the direction of the gamma rays and the trajectory of the positron; (2) θ_--analogous for the electron; (3) ϕ between the trajectories of the positron and of the electron; and (4) Φ -dihedral angle between the planes of θ_+ and of θ_-. The results are shown in the table:

	N	Kr	Xe
Atomic number Z	7	36	54
Number of pairs	116	77	242
Average $\bar{\phi}$	40°	48°	52°
Average $\bar{\theta}_-$	23°	31°	36°
Average $\bar{\theta}_+$	23°	26°	27°

Thus, ϕ and $\bar{\theta}_-$ increase with Z.

On the other hand, Dzhelepov and Vlasov used two counters placed symmetrically on both sides of the direction of the gamma rays. Whereas the Wilson chamber records pairs with any combination of θ_+, θ_-, and Φ, and with any energy ratio, the counters recorded only pairs with $\theta_+ = \theta_-$ and $\Phi = 180°$. The authors had found that for $\Phi = 180°$ the most probable combinations are $\theta_+ \neq \theta_-$. Besides, in the counter method, the appreciable thickness of the target and of the counter walls determines a selection in favor of pairs with a symmetric distribution of energies. Since with increasing Z the tendency toward asymmetry in this respect must grow, the difference $\theta_+ - \theta_-$ will grow, too. The symmetrically placed counters will fail to record this relationship. The table below illustrates the statements made.

	$\lvert\theta_+ - \theta_-\rvert$	$\lvert 180° - \Phi\rvert \leq 80°$		any Φ
	$\leq 10°$	$\leq 15°$	$\leq 20°$	any value
N. Number of pairs	19	30	38	116
$\bar{\phi}$	42°	41°	41°	40°
Xe. Number of pairs	40	56	70	242
$\bar{\phi}$	42°	48°	50°	52°

691 The Scattering of Fast β-Particles through Large Angles by Nitrogen Nuclei by F C Champion and R R Roy Proc Phys Soc 61 532-535 (1948) Dec 1

A combined arrangement of counters and a cloud chamber was used to examine the elastic large-scale scattering of β-particles of approximately 1 Mev energy by nitrogen nuclei. In a total effective track length of nearly 100 km, 131 photographs were obtained in which the scattering angle exceeded 85°. Considering the present results on large-scale scattering together with earlier results on the scattering at smaller angles, the agreement between the experiments and Mott's theory is good over the entire angular range 20-180°.

ABSORPTION AND SCATTERING OF RADIATION (continued)

692 A Theory of Scattering Considering the Damping Effect (K Teorii Rasseyaniya s Uchetom Zatukhaniya) by V I Grigor'ev Zhur Eksptl i Teoret Fiz 18 937-940 (1948) Oct (In Russian)

An exact solution is given of the general case of the problem of meson scattering on free nucleons, the damping being taken into account. Among the consequences of the general solution are the constancy of the number of scatters and the conservation of energy and of momentum.

ASTROPHYSICS

693 Evolution of the Universe by Ralph A Alpher and Robert Herman Nature 162 774-775 (1948) Nov 13

Several errors in Gamow's recent article (Nature 162 680 Oct 30 (1948)) are noted. Making the necessary corrections the following new values are obtained:

$$\rho_{mat} = \frac{4.83 \times 10^{-4}}{t^{3/2}}$$

$\rho_{mat} = \rho_{rad}$ at $t \cong 3 \times 10^{10}$ years (about 10 times the present age of the earth). The latter is taken as indicating that the curvature term in the general equation of the expanding universe should not have been neglected, i.e., that the condensations must have taken place when the expansion was becoming linear with time. By integrating the exact expression (Gamow, Phys Rev 70 572 (1946)) a new value is obtained for $\rho_{mat} = \rho_{rad}$ at $t \cong 10^7$ years, which is more reasonable than the higher value. Also M_c is determined as 3.8×10^7 sun masses and $R_c = 1.1 \times 10^3$ light years. The temperature in the universe at the time of condensation is determined as 600°K, whereas the present day temperature is found to be 5°K.

694 The Hypothesis of the Primitive Atom (L'Hypothèse de l'Atome Primitif) by G Lemaitre Rev Questions Sci 9 321-339 (1948) July 20 (In French)

A non-technical sketch is given of the author's developments in the theory of the expanding universe. It is a cosmogony deducing the origin and the distribution of stars and nebulae from the fundamental phenomenon of the expanding space. The central point is the idea of the unique primitive atom, 10 light-minutes in diameter, an isotope of one of the elements, perhaps hydrogen. The evolution of space-time starts with a radioactive fragmentation of the primitive atom, the cosmic rays being the accompanying radiation.

ATOMIC BOMBS

695 Civil Defense for National Security by the Office of Civil Defense Planning, Russell J Hoply, Director. Washington, D. C., U. S. Government Printing Office 1948 301p

This is a national, regional, state, and community plan for civil defense for national security. It is recommended in this report that a permanent peacetime system of civil defense be adopted which will round out the nation's defense structure and which, in the event of an emergency, can be quickly and easily expanded to meet the exigencies of a given situation. The need and essential functions of civil defense, and the basic principles of the civil defense plan are set forth in an introduction. The report is divided into three topics: (1) Proposed Organization for Civil Defense, (2) Civil Defense Operations and Services, and (3) Legislative requirements to Implement the Civil Defense Program (Including Federal, State, and Local). Radiological defense is given 19 pages and is divided into the following subjects: (1) Estimate of Probable Effects of Atomic Attack, (2) Objectives of a Plan for Radiological Defense, (3) Special Considerations in Planning for Radiological Defense, (4) Radiological Defense Operations in Stricken Areas, (5) The Radiological Defense Organization, (6) Procurement of Personnel, (7) Training of Personnel, (8) Logistics, (9) Communications, (10) Preparation of the Public Essential to Effective Radiological Defense.

ATOMIC BOMBS (continued)

696 Industrial Security and the Atom Bomb by George Root Commerce Magazine 45 No.10 16-17 53-54 (1948) Nov

Some of the findings recently reported by the National Security Resources Board concerning possible means of protecting industry against atom bomb warfare are discussed. Dispersion and decentralization are suggested as being the best defense at the present, although of limited value for the long-range picture. In building a new plant it is suggested that it be located at a distance of at least three miles from any likely targets. It is also suggested that topographical factors be considered in choosing a site for industrial building, since a bomb falling on a flat site usually is more destructive than it would be on a hilly site.

697 Pointers on Atomic Medicine Hospital Topics and Buyer 26 No.11 32 and 34 (1948) Nov

This short, non-technical resume of the aftermath of an atomic bomb is divided into the following topics: radiant energy, large scale rescue work, public health officers, training doctors in treatment, what symptoms to expect, and effects on victims.

698 Preventive Measures for Atomic Explosion by A J Bauer Delaware State Med J 20 121-123 (1948) June

All of the health measures now taken in cases of widespread disaster will have to be put into effect in an atom bombing. In addition there will be the problems caused by radioactivity and the treatment of much larger numbers of people. Important preparatory procedures are psychological preparation, large quantities of whole blood for the fantastic number of required blood transfusions, and training of laymen in blood typing and making blood counts, and the transfusion operation. Treatment may be divided into two broad categories, (1) those which are of proved value: good nursing care, blood transfusion, antibacterials, Vitamin C, intravenous glucose and saline, and (2) those of questionable value: vitamin B_6, toluidine blue, protamine sulfate, rutin, and adrenal cortical hormones. It is important that cities plan to handle the emergencies of their neighboring cities. The director of the emergency plan for one city must be a resident in some other community.

699 The Surgical Treatment of the Effects of the Atomic Bomb by Orville C King Philadelphia Med 44 47 49 51 (1948) Aug 21

Injuries caused by the atomic bomb are divided for convenience into the following classes: (1) those produced by trauma, (2) those produced by burns, and (3) those produced by radiation. The surgeon is primarily interested in trauma and burns, whereas the internist is concerned with radiation. However, the surgeon must have a knowledge of radiation injuries in order to appreciate the complications following such injuries. Patients with radiation sickness who present abdominal cramps, nausea and vomiting, gastro-intestinal hemorrhages, and anorexia among their symptomatology should not have operations for peritonitis or perforation of a hollow viscus attempted on them. These symptoms usually appear within the first day following bombing, but neither epilation nor purpura is present. Traumatic and burn injuries and methods of treating them are discussed.

ATOMIC POWER

700 On the Derivation and Integration of the Pile-Kinetic Equations by Henry Hurwitz Jr. AECD-2438 (KAPL-54) Apr 5 1948 Decl Jan 4 1949 20p Proposed for Publication in Nucleonics

In this report a general solution is obtained for the pile-kinetic equations in the case where the reactivity does not change too rapidly with time. A careful derivation is also given of the pile-kinetic equations for a general assembly in order to show the assumptions which are implicit in the equations, and the limits of their validity.

ATOMIC POWER (continued)

701 Plan Atomic Power to Drive Warship Northern Miner 34 No.42 18 (1949) Jan 6

The Westinghouse Electric Corporation has been commissioned by the United States government to develop a uranium furnace for the propulsion of warships.

702 The Power Plant Prospects of Power Production from Atomic Energy by G E Foxwell Blast Furnace and Steel Plant 36 1364-1368 (1948) Nov

The author discusses power from atomic energy in regard to cost, practicability, availability of supplies, and difficulties encountered in commercial power generation. 1 table.

BIOLOGICAL EFFECTS OF RADIATION

703 The Effect of Nitrogen Mustard and X Irradiation on Blood Coagulation by Leon O Jacobson, Edna K Marks, Evelyn Gaston, J Garrott Allen and Matthew H Block J Lab Clin Med 33 1566-1577 (1948) Dec

A prolonged clotting time occurs in rabbits after a 3 mg per kilogram intravenous dose of nitrogen mustard within 24 hours after administration and persists for approximately 12 days. Spontaneous recovery occurs in surviving animals by the 12th to 14th day. A maximum reduction in blood platelets occurs by the 4th day in rabbits receiving 3 mg per kilogram nitrogen mustard, with recovery by the 12th to 14th day. Thus, the clotting time is prolonged prior to significant platelet reduction. However, the period of platelet reduction (4th through 12th day after nitrogen mustard administration) roughly parallels the period in which maximum increase in the clotting time exists. Spontaneous recovery of the clotting defect and the return of platelet values to normal levels in the peripheral blood occur at a comparable time (circa 14 days). Animals which developed a prolonged clotting time had normal calcium and prothrombin values. The prolonged clotting time and decreased "heparin tolerance" are reversible with antiheparin substances. The anticoagulant present in the blood is probably heparin or a heparin-like substance. The clotting defect produced by nitrogen mustard resembles that produced by whole-body X irradiation (800 r) in rabbits and is also reversible with antiheparin substances. It is suggested that the potentially serious clotting defect may be produced by other agents producing toxic effects directly or indirectly on the blood-forming tissue. This should be borne in mind since a method of treatment is available (antiheparin substances) which may make it possible to pass the critical period of potential hemorrhage until spontaneous recovery ensues. 12 references.

704 Incidence and Origin of Androgenetic Males in X-Rayed Habrobracon Eggs by Anna R Whiting Biol Bull 95 354-360 (1948) Dec

This study was undertaken in order to determine whether the low incidence of androgenetic males or high embryonic mortality is responsible for the low ratio of their occurrence as adults and to work out the cytological mechanism underlying androgenesis in the parasitic wasp Habrobracon juglandis. Well-fed wild type female wasps were X-rayed and mated to untreated males which differed from the wild type by one or more recessive traits.

1.5% of the eggs X-rayed in first meiotic metaphase (14,420 r-28,840 r) developed into androgenetic males. These will develop after any dose up to 54,000 r although lethal dose for the egg chromosomes in this stage is 2400 r. Cytological study of 294 such eggs (14,420 r-36,050 r) showed that three were undergoing androgenetic cleavage while three others were possibly preparing for it. A maximum of six, or 2.04%, did not differ significantly from androgenetic survivors, and it must be concluded that androgenetic embryos at doses used are as viable as embryos developing in untreated eggs.

Chromatin bridges which appeared in meiotic division II after treatment in first meiotic metaphase retarded and distorted the egg pronucleus, occasionally to such a degree that the sperm pronucleus cleaved and developed into a normal fertile haploid male with paternal traits only. The almost complete absence of these bridges after treatment in first meiotic prophase will explain the failure of androgenetic males to develop in these eggs. 14 references.

BIOLOGICAL EFFECTS OF RADIATION (continued)

705 Influence of Fractioned Roentgen Radiation on Bacterial Agglutination Titre by Johannes Clemmesen and Else Krag Andersen Acta Path Microbio Scand 25 611-614 (1948)

Rabbits were given total body irradiation in effective doses of 120 r five times in this investigation of the possibilities offered by X-ray irradiation as a means of lowering the resistance of experimental animals to inoculations of various kinds. Immunization was carried out by a single intravenous injection of 0.1 cc H-Antigen of B. paratyphus B (formolized broth-culture). From the agglutination titer curves and their general experience the authors conclude: (1) Fractioned doses are more effective for lowering of resistance than single doses. (2) It seems possible to prevent development of immunity without serious damage to the general health of the animals. (3) A dose of rays which if given before immunization will delay the development of immunity does not show the same effect if applied after immunization. (4) If an insufficient part of the radiation has been applied before immunization, the remaining dose given after the latter will be more effective than the total dose given at the same period. Even an immunity otherwise apparently refractory to radiation may in this way be prevented from developing. (5) The effect may be visualized as a blockage of the reticuloendothelial system which must be established at the appearance of antigen and must be repeatedly renewed in the presence of the latter. 3 tables and 6 references.

706 Influence of Roentgen Radiation on the Spread of Vaccinia Virus in Young Rabbits by Johannes Clemmesen and Else Krag Andersen Acta Path Microbio Scandinavica 25 615-618 (1948)

Heavy X-ray, 540 r, irradiation with fractioned doses failed to show any certain effect favoring the spread of vaccinia virus in rabbits two months old. There may be signs of a weak effect, and it cannot be excluded that the dosage may have been insufficient.

A corresponding experiment performed on young rabbits about 30 days old with 420 r doses of X-rays showed a definite spread of vaccinia in most experimental animals but none in the controls.

707 Mutations in Streptomyces Flaveolus Induced by X-Rays and Ultraviolet Light by Albert Kelner J Bact 56 457-465 (1948) Oct

In order to determine the comparative usefulness of ultraviolet light and X-rays as tools for inducing mutation in actinomycetes, the irradiation doses giving maximum mutation frequency, and to study the types of morphological mutants most easily induced, suspensions of Streptomyces flaveolus ATCC3319, as a representative species, were given ultraviolet irradiation doses up to 20,000 ergs x mm^{-2} and X-ray doses up to 300,000 r. Results with ultraviolet irradiation were variable, but in all cases mutation frequency rose steadily with dosage. There was no evidence of a falling off of the rate of increase with large doses. The maximum mutation frequency observed was 24% in one experiment. With X-irradiation, mutation frequency rose with dosage up to 200,000 r; above this the rate of increase leveled off. The highest mutation frequency was 15%. X-rays are considered preferable to ultraviolet for inducing mutation because they give more uniform results. 16 references and 4 graphs.

708 Nucleic Acid Content in Intestines of Rats after X-Radiation by J O Ely and M H Ross Cancer Research 8 285-294 (1948) June

The effects of total-body X-radiation (600 r) of rats on the crypts of Lieberkühn were studied by ultraviolet-light-absorption and other methods. It was found that X-radiation caused a decrease in the amount of ultraviolet-light-absorbing material in the crypts of Lieberkühn of rats at various levels along the intestinal tract; the decrease in the amount was found at various periods of time ranging from 4 hours to 17 days. Involved in the decreased absorption of ultraviolet light were desoxyribonucleic acid, ribonucleic acid and the structural framework of the tissue, all of which were found to be reduced. The amount of inorganic ash also was found to be reduced. 12 references 8 tables 6 figures.

BIOLOGICAL EFFECTS OF RADIATION (continued)

709 Reduction of Undesirable By-Effects in Products Treated by Radiation by Arno Brasch and Wolfgang Huber Science 108 536-537 (1948) Nov 12

By using very high intensities of radiation released in ultrashort times and evacuated irradiation chambers or special glass containers, undesirable side reactions may be reduced in the sterilization and preservation of various foodstuffs and therapeuticals. In the case of foodstuffs, cooling before irradiation has a distinctive effect on the exclusion of undesirable side reactions.

BIOLOGY, GENERAL

710 The Effect of Toluidine Blue and of Thrombokinase upon the Inactivation of Thrombin (Die Wirkung des Toluidinblaus und der Thrombokinase auf den Vorgang der Thrombininaktivierung) by Z Horn, M Gerendás and L Borsodi Experientia 4 402-403 (1948) Oct 15 (In German)

It has been shown previously that toluidine blue and thrombokinase are capable of binding heparin and also that heparin increases the reaction velocity of the thrombin-inactivation reaction. The present investigation was undertaken to study the inactivation process of thrombin in the presence of toluidine blue or of thrombokinase and also in the presence of heparin, heparin and toluidine blue, and heparin and thrombokinase. The results of the study are recorded in two graphs which demonstrate that toluidine blue or thrombokinase is capable of strongly reducing the speed of thrombin inactivation, thus proving the heparin-binding effect of these two substances by the decrease of thrombin-inactivation.

711 Industrial Fluorosis of Farm Animals in England, Attributable to the Manufacture of Bricks, the Calcining of Ironstone, and to Enammelling Processes by F Blakemore, T J Bosworth and H H Green J Comp Path Therap 58 267-301 (1948) Oct

It is shown in this account that the contamination of vegetation is entirely superficial and not caused by fluorine compounds carried down into the soil by rain. The origin of the aerial fluorine is discussed in relation to the industrial processes involved, and extent of damage related to distance from source and direction of prevailing wind. Representative clinical cases are recorded and the histology of skeletal changes is illustrated by microphotographs.

Urinary analysis was found to be a convenient way of diagnosing fluorosis, especially in subclinical cases where no dental signs or obvious skeletal changes were present, and the value of this simple method is emphasised for surveying areas of potential fluorine hazard in respect of either human or animal population. By correlating urinary excretion with fluorine values on rib bone removed surgically in an animal taken away from the source of fluorine ingestion, it was found that about half of the original skeletal fluorine still remained after 8 months and that, although marked clinical improvement occurred quite soon, urinary values remained far above normal (13 p.p.m.) in equilibrium with the very slow change of bone value in the later stages of skeletal reconstruction. A high urinary value may reflect either high current consumption of fluorine, or the skeletal storage of fluorine in the past, and close correlation in any given outbreak of disease between clinical symptoms, urinary output of fluorine and changing levels of pasture contamination can be expected.

Points of difference between fluorosis in its veterinary and medical aspects are briefly discussed in relation to social consequences and the hazards to human subjects and the economics of control of fluorine hazards. 28 references. 10 figures.

712 Isotopic Analysis of the Oxygen Evolved by Illuminated Chloroplasts in Normal Water and in Water Enriched with O^{18} by A S Holt and C S French Archives Biochem 19 429-435 (1948) Dec

The authors believe it can be concluded that the oxygen evolved by illuminated chloroplasts in the presence of various oxidants originates from the splitting of water molecules brought about by a photochemical reaction. 20 references.

BIOLOGY, GENERAL (continued)

713 Papers Presented at the Meeting of the Society of General Physiologists Biol Bull 95 p 281-287 (1948) Oct

The following papers were among those presented at the meeting of the Society of General Physiologists (place and date of meeting not indicated, but apparently Woods Hole, Mass., summer 1948): Enzyme Activity and Radiation Sensitivity of Enzyme-Substrate Films, by Daniel Mazia and Gertrude Blumenthal; Studies of the Kinetics of Potassium Exchange Between Cells and Plasma of Canine Blood in Vitro Using K^{42}, by C. W. Sheppard and W. R. Martin. Abstracts of these papers are given.

714 Program and Abstracts of Scientific Papers Presented at the Marine Biological Laboratory, Summer of 1948 Biol Bull 95 238-280 (1948) Oct

The following papers were among those presented at Woods Hole, Mass: The Order of Amino Acids in Silk: An Application of Isotopic Derivative Technic, by Milton Levy and Evelyn Slobodiansky; The Ion Permeability of the Giant Axon of Squid, by M. A. Rothenberg; Penetration and Effects of Low Temperature of Cyanide on Penetration of Radioactive Potassium into the Eggs of Strongylocentrotus Purpuratus and Arbacia Punctulata, by E. L. Chambers, W. White, Nylan Jeung, and S. C. Brooks; Dominant Lethals Induced by X-Rays in Sperm of the Chalcidoid Wasp Nasonia Brevicornis Ashmead (=Mormoniella vitripennis (Walker) fide Muesebeck in lit.), by D. T. Ray; X-Radiation Effects on the Restitution of Dissociated Microciona, by C. K. Liu; Studies of the Chemical Form of P^{32} after Entry into the Arbacia Egg, by P. H. Abelson; Penetration of Radioactive Phosphate into the Eggs of Strongylocentrotus Purpuratus, S. Franciscanus, and Urechis Caupo, by S. C. Brooks and E. L. Chambers; Distribution of Radioactive Phosphate in the Eggs of the Sea Urchin Lytechinus Pictus, by E. L. Chambers, A. Whiteley, R. Chambers, and S. C. Brooks; The Incorporation of P^{32} into the Nucleoproteins and Phosphoproteins of Developing Arbacia Embryos, by C. A. Villee, M. Lowens, M. Gordon, E. Leonard, and A. Rich.

Abstracts of the papers are given.

CERAMICS

715 Ceramic Coated Metals for Aircraft Power Plant Applications by R A Jones Steel Processing 34 649-651 (1948) Dec

The author discusses, in a general way, some types of ceramic coatings. The advantages derived by using ceramic coatings are briefly described.

CHEMISTRY, ANALYTICAL

716 A Rapid Colorimetric Method for the Determination of Microquantities of Thorium by R H Hall. AECD-2437 (UR-47) Nov 12 1948 Decl Jan 11 1949 25p Proposed for publications in Ind and Eng Chem, Analyt Ed

A rapid colorimetric method is described for the determination of microquantities of thorium. The basis of the method is the formation of a stable colored complex with excess carminic acid in acid solution. The spectral absorption at 560 to 590 mμ and constant pH is directly proportional to the concentration of thorium over the range 2.5 to 25.0 μg/ml. The stable complex formed in the presence of excess reagent contains 4 mols of carminic acid per mol of thorium. The method has the advantages that the colored complex between thorium and carminic acid forms almost instantaneously in cold solutions, eliminating the necessity for heating to accelerate color development, and the color is stable indefinitely at room temperature. Ferrous and ferric iron and aluminum interfere seriously in the determination of thorium. The error involved in the determination is two per cent or less, the generally accepted limit of accuracy of colormetric methods.

717 Ion Exchange by Robert Kunin Ind and Eng Chemistry 41 55-59 (1949) Jan

This is a review type article on the advances in the synthesis of new exchangers, new approaches in the engineering principles involved, and the large scale studies of processes involving ion exchange equilibria. 130 references.

CHEMISTRY, ANALYTICAL (continued)

718 The Ion-Exchange Separation of Zirconium and Hafnium by K Street Jr and G T Seaborg J Amer Chem Soc 70 4268-4269 (1948) Dec

This article is based on AECD-2435. An abstract of this document has been listed in Nuclear Science Abstracts as Abstract No. II-420.

719 Methods of Analysis for Adsorption. Chromatography (Métodos de Análisis por Adsorción) by Fernando Velasco Ion 8 591-600 (1948) Sept (In Spanish)

This paper traces the historical development and presents the fundamental theories of chromatographic analysis. Some of the adsorbents, solvents, and apparatus used are discussed and 37 references are given.

720 On Certain Methods of Measurement of the Effectiveness of Ion Exchangers (Quelques mesures de détermination d'efficacité des échangeurs d'ions) by G Austerweil Bull Soc Chim France 948-952 (1948) Sept-Oct (In French)

The chromatographic ion exchanges on organic adsorbers are studied from the point of view of the comparative effectiveness of the latter. Whereas the effectiveness of an inorganic ion exchanger is characterized by its "total capacity" and its "exchange coefficient," these magnitudes, when applied to an organic exchanger prove either insufficient or indeterminable. For a cation exchanger, the quantity pK, measuring the exchanger's acidity, must be determined. A column composed of layers of exchangers of increasing pK could be used for a complete separation of different cations in a solution. An example of such a column of exchangers is the series: lignite of Cassel, tannin-formol resin, sulfonated lignite, resorcine-formol-ω-sulfinic resin, formol-phenol-sulfonic resin. Similarly, an anion exchanger is characterized by its basicity, measured by the constant K in the equation

$$\left\{\left[(m - m_n)/m\right] + 1\right\}^{1/n} = K$$

Here m and m_n are quantities of anion fixed, by an aliquot part of the exchanger, from solutions of pH O and n, respectively. The following anion exchangers were investigated: poly-quinone-imine, poly-amino-styrolene, melamine-formol resin, and meta-phenylene-diamine-formol resin. In the last two substances the polymerisation goes through the amino group; it was found that with anion exchangers of this class m_n decreases very slowly with n (they resist hydrolysis); these exchangers should therefore be employed when working with dilute solutions. However, their "capacity" is considerably lower than that of other compounds studied (the absolute values of m and m_n are smaller).

CHEMISTRY, GENERAL

721 The Hydrogen Fluoride Dipole Moment and the Structure of the Dimer by R A Oriani and C P Smyth J Chem Phys 16 1167-1168 (1948) Dec (Letter to the editor)

Using the quantum mechanical equation for the dipole moment (μ), $\mu = [9kTP_m/4\pi N(1 - (h^2)/(24\pi^2 IkT))]^{1/2}$ yields a value of 1.98×10^{-18} when using data of Hannay and Smyth (J Amer Chem Soc 68 171 (1946)) and of Oriani and Smyth (J Amer Chem Soc 70 125 (1948)), whereas the value calculated by the classical equation gives 1.91×10^{-18}. Pm = molar orientation polarization, k = Boltzmann constant, h = Planck constant, N = Avogadro number, T = absolute temperature, I = moment of inertia.

722 Introduction of Radioactive Tracers into Antisera by F D S Butement Nature 162 731 (1948) Nov 6

Radioiodine was introduced into the globulin molecule of a Proteus vulgaris rabbit antiserum without seriously impairing the agglutinating power of the serum.

723 Isotope-Labeled Compounds from Texas Research Group Chem and Eng News 26 3789 (1948) Dec 20

Arrangements for synthesis and distribution of isotope-labeled compounds have been completed at the Texas Research Foundation, Renner, Texas. Satisfactory synthetic procedures have been developed

CHEMISTRY, GENERAL (continued)

for the S-35 labeled compounds methionine, cystine, and cysteine as well as the deuterium-labeled compounds deuterated ammonia and deuterated acetylene and carbon 14 labeled compounds glutamic acid and tyrosine. Synthesis of other compounds will be undertaken after proper approval.

724 John Newlands and the Periodic System by F A Paneth Discovery 9 286-289 (1948) Sept

The historical development of the periodic system of the elements is discussed. Although Mendeleef is usually given most of the credit for this work which he published in comprehensive form in 1870, the author notes that in a series of papers published by Newlands during the years 1863-1866 much of the work had already been done. In particular it is noted that Newlands was the first to show that by arranging all the known elements in the order of their atomic weights a classification was obtained in which elements of similar properties followed each other at regular intervals. In addition, Newlands assigned a number to each element which was considered its essential feature; neither Meyer nor Mendeleef fully recognized this fact. Tables of the short and long period systems are shown and the newer elements are discussed.

725 N^{15}-Containing Compounds Available from Eastman Chem and Eng News 27 87 (1949) Jan 10

Nitrogen 15 in the form of either nitric acid in aqueous solution or potassium nitrate as a dry solid is being offered by Eastman Kodak Company.

726 Outlines of Physical Chemistry by Farrington Daniels New York, John Wiley 1948. viii + 713p

This general text on physical chemistry has been so completely rewritten it should be regarded, as suggested by the author in his preface, as the first edition of a new book. In addition to the topics usually found in such a text, such topics as the quantum theory, photochemistry, and nucleonics are treated in some detail. The problems included in the text range from the calculation of atomic weights to the determination of the rate of transmutation in an atomic pile. An extensive bibliography is also included.

727 The Production of Anhydrous Hydrofluoric Acid Ind Chemist 24 801-811 (1948) Dec

The equipment used at the various stages of anhydrous hydrofluoric acid production is described. For concentrations above 80%, mild steel is used, while for lower concentrations, neoprene, saran, or polythene is employed. The British apparently have not solved their pump packing difficulties.

CONTROL OF ATOMIC ENERGY

728 The Atom and Human Welfare Australian J Sci 11 55 (1948) Oct

The following series of public lectures and discussions was arranged by the Royal Society of New South Wales and delivered through the Extension Board of the University of Sidney during July: The Atom and Radioactivity, by D. P. Mellor; Artificial Transformations and Nuclear Fission, by R. E. B. Makinson; Atomic Physics and Human Welfare (Generation of Power; Radioactive Tracers), by F. Lions; International Control of Atomic Energy, by G. H. Briggs.

729 Atomic Energy and Society by H R Allan Nature 162 1005-1006 (1948) Dec 25

A conference on "Atomic Energy and Society" and "Atomic Energy and the Scientist" was held in London on October 30, 1948. The various problems and topics included in these categories were presented by the following speakers: R. E. Peierls, M. H. L. Pryce, P. M. S. Blackett, Sir George Thomson, N. F. Mott, E. U. Condon, Sir Henry Dale, and E. H. Burhop.

CORROSION AND ANTI-CORROSION

730 Systematic Examination of Inhibition to Corrosion (Examen Systématique de l'Inhibition de la Corrosion) by H C J de Decker Metaux et Corrosion 23 226-231 (1948) Oct (In French)

This is a discussion of some of the practical problems involved in testing substances for their suitability as corrosion inhibitors. Variables to be considered are enumerated, such as concentration of inhibitor, time of exposure, state of the metal surface, and distance below the surface of the liquid. Different methods of plotting results are discussed.

731 The Use of Inhibitors for Controlling Metal Corrosion. Part I. General Principles by G T Colegate Metallurgia 39 18-20 (1948) Nov

The author mentions briefly the types of corrosion which may occur and then proceeds to classify and discuss the various inhibitors in use. The inhibitors are classified as anodic, cathodic, or adsorption.

COSMIC RADIATION AND MESONS

732 The Cosmic-Ray Intensity above the Atmosphere by A V Gangnes, J F Jenkins Jr and J A Van Allen Phys Rev 75 57-69 (1949) Jan 1

In a series of flights of Aerobee and V-2 rockets at geomagnetic latitude $\lambda = 41°N$, single Geiger counters and Geiger counter telescopes have been employed to measure the total intensity of cosmic rays above the appreciable atmosphere. The directional intensity j, averaged over the upper hemisphere, is found to be 0.120 ± 0.009/sec/cm^2/steradian, constant from 55-km altitude to the highest altitude reached of 161 km. This result is an experimental upper limit to the primary intensity of charged particles at this latitude.

733 Decay and Capture of Slow Mesons in Dielectrics by H Fröhlich, R Huby, R Kolodziejski and R L Rosenberg Nature 162 450-451 (1948) Sept 18 (Letter to the editors)

Calculations based on energy considerations are given which seem to indicate that the time required by a meson in reaching a K-orbit in a dielectric material is greater than the value arrived at by Fermi, Teller, and Weisskopf (Phys Rev 71 314 (1947)), although from theoretical considerations it is difficult to determine whether this time is of the same order of magnitude as the decay time (approximately 2×10^{-6} sec). In the experiments of Conversi, Pancini, and Piccioni (Phys Rev 71 209 (1947)), in which the decay electrons from mesons coming to rest in solids were observed, decay electrons from negative mesons were observed in the light elements only. For heavy elements it is generally assumed that negative mesons are captured by atomic nuclei before they can decay. The absence of capture of negative mesons in light nuclei has led Teller et al to the conclusion that it takes less than 10^{-12} sec for a meson to reach an energy of about 1000 ev, where its velocity approximates that of the electrons in outer orbits, i.e., 10^8 cm/sec. Assuming that the meson loses its remaining energy rapidly, they conclude that it reaches the K-orbit in about 10^{-18} sec. This calculation overestimates the energy transfer from slow mesons to electrons (Fröhlich, Nature 160 255 (1947); Rosenberg, unpublished). The author indicates that in the case of dielectrics the energy loss resulting from the Auger effect cannot be disregarded as negligible in comparison with radiation losses, since the Auger effect is extremely sensitive to the properties of the highest bound meson orbit.

734 The Density Spectrum of Extensive Atmospheric Showers (Auger Showers) (Le Spectre de Densité des Grandes Gerbes Atmosphériques (Gerbes d'Auger) by A Loverdo and J Daudin J Phys et Radium 9 134-136 (1948) Apr (In French)

The density spectrum has been studied for extensive air showers at an altitude of 2900 m. In particular, the region of very low densities has been explored using groups of counters of approximately 2500 cm^2 surface. The measurements carried out for bases of 4 m and of 50 m indicate the relationship between the exponent γ of the density spectrum and the extent of the showers. Tabulated data and curves obtained are given.

COSMIC RADIATION AND MESONS (continued)

735 The Disintegration of the Meson (Sur la Désintégration du Méson) by C Marty and J Prentki J Phys et Radium 9 147-149 (1948) Apr (In French)

In order to interpret some plates obtained by Lattes, Occhialini, and Powell (Nature 160 453 and 486,1947)), the disintegration probability for a π-meson of integral spin and for two μ-mesons of spin 1/2 has been studied. After making certain assumptions as to the π-meson-μ-meson coupling constants, which may be justified in terms of Møller's theory (Kgl Danske Videnskab Selskab 18 fasc 6 (1941)), mean lives of the order of 10^{-8} to 10^{-9} sec are obtained. Some difficulties relating to the β-activity of the μ-meson are described.

736 The Extensive Cosmic-Ray Showers and Bursts by J Clay International Conference on Fundamental Particles and Low Temperatures Vol. I 47-56. London, Physical Society 1947

From data taken on extensive cosmic ray showers and bursts it is concluded that the lowest estimate of the energy of big showers with a frequency of 1 in 6000 hours is 10^{16} ev. The extension of the showers was 3×10^2 to $10^3 m^2$. From the cascade theory the mean energy of the primary particles producing the showers was determined as not exceeding 2×10^9 ev.

737 The Hypothesis of an Intermediate Light Particle (λ-Meson) in Extensive Cosmic Showers in Air (Auger Showers). Study in a Wilson Chamber (L'Hypothèse d'une Particule Intermédiaire Légère (Méson λ) dans les Grandes Gerbes Cosmiques de l'Air (Gerbes d'Auger). Étude a la Chambre de Wilson) by Jean Daudin J Phys et Radium 9 137-142 (1948) Apr (In French)

The dispersion of the secondary particles in the showers which form a part of the extensive atmospheric showers requires a higher mean energy than that predicted by the electronic cascade theory and may be explained by the presence of particles such as the λ-meson having a mass which is a small multiple of that of the electron. Such a particle also explains some peculiarities observed on the plates obtained using a Wilson chamber activated by extensive showers. 2 tables and 10 plates.

738 Investigation into the Production of Mesons by L Jánossy International Conference on Fundamental Particles and Low Temperatures Vol. I 36-43. London, Physical Society 1947

Tabulated data obtained for penetrating showers using a seven-fold coincidence arrangement are given. These data are discussed and compared with previous investigations of this type. From rough calculations it is concluded that the penetrating showers can be accounted for in terms of a primary proton component.

739 Mass Measurements of Mesons by the Method of Elastic Collision by L LePrince-Ringuet International Conference on Fundamental Particles and Low Temperatures Vol. I 43-47. London, Physical Society 1947

The cloud-chamber "elastic collision" method for determining meson masses is discussed. Photographic evidence of the existence of a particle of mass $(990 \pm 120)\ m_o$ is shown. The possibilities that this particle is either a normal meson or a proton are discussed and rejected, and the author suggests that the track observed might have been produced by a heavy meson.

740 On the Absorption of Nucleonic Component in Cosmic Rays by G Bernardini, G Cortini and M Manfredini. Phys Rev 74 1878-1879 (1948) Dec 15 (Letter to the editor)

From the Pb absorption data on a number of "stars" (considered as local indicators of the nucleonic component of cosmic radiation) observed in a laboratory at 3500 m and in balloon flights, the related cross section in air has been calculated as $0.177 \times 10^{-24}\ cm^2$. This value is in agreement with the relationship $\sigma \simeq k \cdot A^{2/3} \times 10^{-26}\ cm^2$ obtained in an earlier paper (Phys Rev 74 845 (1948)). Using $k = 2.95$, cross sections for Pb, Al, and air have been calculated from this expression. These values,

COSMIC RADIATION AND MESONS (continued)

which are shown, are in excellent agreement with the experimental values. It was also found that the ratio N_m/N_S increases strongly at altitudes of about 20 km, where N_S is the number of stars having at least three prongs and N_m the number of slow mesons. From various considerations it is concluded that the number of mesons produced increases as their energy decreases.

741 On the Existence of Two Mass Values for Mesons (Zur Existenz von zwei Massenwerten für Mesonen) by Kurt Hogrebe Z Naturforsch 3a 61 (1948) Jan (In German)

This is a statistical analysis of measurements of meson masses as reported by Fretter (Phys Rev 70 625 (1946)) and Hughes (Phys Rev 71 387 (1947)). The distribution curve shows two maxima corresponding to masses 237 m_e and 171 m_e, respectively. Since the ratio (1.39) is smaller than that (1.9) found by Lattes, Occhialini, and Powell (Nature 159 694 (1947); 160 453 and 486 (1947)), the question arises whether the masses 237 m_e and 171 m_e could be attributed to the π-meson and μ-meson of these authors, or whether, perhaps, a third mass between 300 and 450 m_e should belong to the π-meson. On the other hand, if one attributes the mass 171 m_e to the μ-meson, the ratio 1.39 must indicate that the disintegration of a π-meson leads to a formation of a non-ionizing particle with a mass much smaller than that of a meson.

742 The Penetrating Particles in Cosmic-ray Showers: II. The Lightly-ionizing Penetrating Particles in Penetrating Showers by G D Rochester and C C Butler Proc Phys Soc 61 535-541 (1948) Dec 1

The momentum spectrum of the penetrating particles in a small sample of penetrating showers has been measured. Most of the particles are positive and have momenta of the order 10^9 ev/c. From a study of the interaction of these particles with nucleons in a lead plate it is concluded that although a small number may be μ-mesons most are protons, π-mesons, or heavier mesons. 6 photographic plates.

743 The Properties of Cosmic Radiation at Very High Altitudes by Martin A Pomerantz Phys Rev 75 69-80 (1949) Jan 1

The variation of the vertical cosmic-ray intensity as a function of altitude has been investigated in a series of free-balloon ascents with standardized quadruple-coincidence-counter trains containing various amounts of interposed absorber, to a maximum thickness of 7.5 cm Pb. The curves thus obtained converge at the "top of the atmosphere." A maximum occurs in the curve with 4 cm of Pb, but disappears with 6 cm of Pb. Cosmic-ray absorption curves at various altitudes above that corresponding to an atmospheric pressure of 250 mm of Hg are plotted from the data, as are integral and differential distributions-in-range. The relative stopping powers of carbon and lead are also available from the data.

Disturbing effects such as those arising from side showers and scattering appear to be negligible. An extrapolation procedure, which leads to results consistent with those of other experiments, provides a new picture of the composition of the cosmic rays in the atmosphere. With heavier particles (P + M) displaying a maximum intensity at a higher altitude than electrons (E), the conclusions drawn from the present investigation are compatible with a primary radiation consisting of protons (and possible heavier nuclear particles) producing mesotrons which subsequently give rise to the electronic component. Comparison of the results reported here with those of Schein and Allen (unpublished data) indicate an absorption of primaries, by a process other than ionization, in thicknesses of Pb between 7.5 and 18 cm.

744 Relation between the Masses of Mesons by Jean-Louis Destouches Nature 162 451-452 (1948) Sept 18

By applying the "principle of associated particles" of Mme. P. Destouches-Février (Compt Rend 226 878 (1948)) to the function y(u) in Cazin's meson theory (Compt Rend 226 641 and 880 (1948)), theoretical values of the ratios m_u/m_e, m_p/m_e, and m_p/m_u have been computed and tabulated, where m_p, m_u, and m_e are the masses of the pi-meson, mu-meson, and electron, respectively. The theoretical

COSMIC RADIATION AND MESONS (continued)

relationships between the particle masses agree with the experimental results of several investigators. From this it is concluded that the nuclear forces may be interpreted as due to mutual exchanges of mesons (mass greater than 900 m_e) of two types, having spins of 1 and zero, and that the corresponding forces differ from ordinary nuclear forces.

745 Zenithal Distribution of the Hard Component of Cosmic Radiation (Distribution zénithale de la cômposante pénétrante du rayonnement cosmique) by Anatole Rogozinski and André Voisin Compt Rend 227 1092-1094 (1948) Nov 22 (In French)

With the counter telescope recently described by Rogozinski and Lesage (Compt Rend 227 1027 (1948)), measurements were made of the hard component (mesons), filtered through 6, 14, and 22 mm Pb, at angles θ from zenith equal 0°, 30°, 60°, and 73° East. The results are expressed by the formula $I(\theta) = I(0) \cos^{2.20}\theta$. Presumably a more precise method would reveal a dependence on the filter thickness. If the shower-producing component was not eliminated, the relationship would be a $\cos^2\theta$ law, which has been stated by many authors.

DEUTERIUM AND DEUTERIUM COMPOUNDS

746 Rotational Absorption Spectrum of HDO by M W P Strandberg. MIT Technical Report No. 85 Sept 25 1948 9p (NP-525)

The $2_2 - 2_1$, $3_0 - 3_1$, $4_{-3} - 3_1$, and the $5_0 - 5_1$ rotational absorption transitions of HDO have been observed and identified on the basis of their Stark effect. By comparing the theoretical and experimental Stark shift, the dipole moment for all these transitions has been measured as $1.84 \pm .01$. The effective HDO angle is also determined as $104° \pm 30'$ and the asymmetry coefficient, K, as about −.696. The line breadth $\Delta\nu$ at one atmosphere is $.38 = .04$ cm^{-1}. None of these quantities is in disagreement with independent determinations.

FLUOROCARBONS

747 Elastomers from Fluoroprene by W E Mochel, L F Salisbury, A L Barney, D D Coffman and C J Mighton Ind and Eng Chem 40 2285-2289 (1948) Dec

Fluoroprene (2-fluoro-1,3-butadiene) polymers have an amorphous structure in the stretched state, require reinforcement with fillers to develop high tensile properties, are highly freeze and oil resistant, and burn at a much slower rate than GR-S or natural rubber. Their electrical properties are superior to polychloroprene vulcanizates. The polymerization and vulcanization are described, and properties of polyfluoroprene, as well as copolymers with dimethyl carbinol and acrylonitrile, are listed.

748 The Solubility of Fluorocarbons by Robert L Scott J Amer Chem Soc 70 4090-4093 (1948) Dec

The author has attempted to see whether the fluorocarbons fit into the framework of the "internal pressure" theory of the solubility of non-electrolytes or whether they are anomalous. Comparing calculated solubility parameters with experimental results showed that the low solubilities are not anomalous but are the thermodynamic consequences of their low solubility parameters (lowest of all substances liquid at room temperatures).

749 Trifluoromethyl Hypofluorite by K B Kellogg and George H Cady J Amer Chem Soc 70 3986-3990 (1948) Dec

The compound, trifluoromethyl hypofluorite, CF_3OF has been produced in two ways. One method of preparation followed the procedure of Fowler et al (Fowler, Burford, Hamilton, Sweet, Weber, Kasper, and Litant, Ind and Eng Chem 39 292 (1947)), that is, using CoF_3, whereas the other followed that of Cady et al (Cady, Grosse, Barber, Burger, and Sheldon, Ind Eng Chem 39 290 (1947)), using fluorine in the presence of a heated catalyst of copper ribbon coated with fluorides of silver. The produced gas has

FLUOROCARBONS (continued)

an odor similar to fluorine or oxygen fluoride, a boiling point of −95°C, is stable up to 450°C, and is a highly reactive oxidizing agent. Sketches of apparatus are given, as is the vapor pressure curve for the compound.

HEALTH PROTECTION

750 Berylliosis by Stanley A Wilson Rhode Island Med J 31 719-722 (1948) Dec

This paper is a brief resume of the disease known variously as "Pneumonitis of Be Workers," "Pulmonary Granulomatosis of Be Workers," and "Delayed Chemical Pneumonitis," but here called berylliosis. It includes a brief history, a listing of the most common symptoms, the pathological findings in acute cases, and a description of the lesion in so-called chronic pulmonary granulomata. Differential diagnosis is difficult and the conditions which may be confused with chronic berylliosis are many. No specific treatment has been found for the disease, though every known means has been tried to improve exchange of gases in the lungs.

751 Death from Exposure to Beryllium Lancet 255 937 (1948) Dec

This is a report of what is probably the first death in Great Britain caused by exposure to beryllium. An earlier account of the case appeared in Lancet 255 530 (Nuclear Science Abstract No. 1538). Death was due to granulomatous fibrosis of the lungs and failure of a hypertrophied right heart. The microscopical appearances in the lungs somewhat resembled silicosis and sarcoidosis but were not typical of either.

INSTRUMENTS

752 Design of an Improved-Yield Discharge Tube by Jaroslav Pachner Nucleonics 3 No.6 43-51 (1948) Dec

An improved-yield discharge tube is described in which a large proportion of the kinetic energy of the particles which have not participated in the nuclear reactions is fed back into the high voltage generator by means of retardation in the electrostatic field. A thin target is used to minimize the kinetic energy losses of particles passing through it. The theory and design details of the tube are discussed and the voltage and current intensities for this tube are compared with those of other tubes for three nuclear reactions. The data indicate that the tube requires less energy per nuclear reaction. It is suggested that a tube of this type is suitable as a source of neutrons as well as for use in accelerating particles which previously have been accelerated only in cyclotrons. It is also noted that application of the principles of this tube to the isotron would increase its efficiency considerably.

753 Electron Lens Correction Device by James Hillier, Cranbury, N. J., assignor to Radio Corporation of America, Delaware. U. S. Patent No. 2,455,676 Dec 7 1948

An improved method of and means for correcting for axial asymmetry in electromagnetic and electrostatic electron lenses has been developed. Means have been devised for correcting for spherical and chromatic aberrations. Metallic correcting elements interposed in the lens field adjacent to the path of the electron beam overcome the practical difficulties of limitations in mechanical precision and non uniformity in the magnetic or structural properties in the lens elements.

754 An Electron Tube for Viewing Magnetic Fields by S G Lutz and S J Tetenbaum Elec Eng 67 1143-1146 (1948) Dec

A gas-filled diode tube is described which is useful in the study of magnetic fields. In the tube, electrons from the oxide-coated cathode are accelerated through holes in the anode by a low potential of about 10-15 volts. Thus, unlike the more familiar applications of magnetic deflection of electrons, the perpendicular components of the electron velocities are so small that their helical orbits are of small diameter. The emerging electrons produce ionization of the mercury vapor in the tube and the bluish glow resulting from deionization indicates the electron paths. Although the tube is useful for observing the field pattern, it is not adapted to the measurement of field strength. The theory and operation of the tube are discussed and photographs of several modified designs are shown.

ISOTOPES

755 The Production of Stable Isotopes and Their Uses in Research by W C Davis, L O Love and L O Gilpatrick. AECD-2436 Nov 18 1948 Decl Nov 24 1948 11p Document for sale by AEC

In December, 1945, a program was undertaken at the Y-12 plant in Oak Ridge for the purpose of separating the naturally occurring isotopes. It was proposed to use the equipment and techniques developed for the electromagnetic concentration of U^{235} for the separation of the isotopes of the entire periodic table of the elements insofar as this should prove feasible. This program has been continued until at the present time some 37 elements have been successfully processed to give concentrates of all the isotopes of these elements. In the great majority of cases these isotope concentrates are available for distribution to qualified research organizations in quantities practical for most scientific purposes. The equipment used in the electromagnetic process is known as a "calutron." The calutron is a version of the mass spectrograph modified to favor the production of isotopes rather than their analysis, which has been the objective in the past. Present work, for example, on the production of the mercury isotope 204 is directed toward obtaining the highest possible degree of purity. The feed, or charge, material for the calutron can be solid, liquid, or gaseous, but it must fulfill certain conditions. It must supply sufficient vapor to maintain an arc within the working temperature range of the equipment; it must also be commercially available or easily synthesized from some commercially available compound; and it should be inexpensive if possible. The greatest field of usefulness is among those applications which depend upon the nuclear properties of the isotopes. There is, of course, a large field of application for stable isotopes in the measurement of fundamental nuclear properties such as capture cross section measurements for all types of bombardment but especially for neutron bombardment. Another use of isotope concentrates is in the identification of the complex activity produced by bombarding elements which are composed of many isotopes.

756 Isotopes of Carbon and Oxygen in the Earth's Atmosphere by Leo Goldberg, Orren C Mohler and Robert R McMath Phys Rev 74 1881-1882 (1948) Dec 15 (Letter to the editor)

Calculations have been made which may prove useful in the determination of the abundances of carbon and oxygen isotopes. To assist in the identification of possible isotope bands, and the wave numbers of the 000-201, 000-121, and 000-041 bands of both $C^{13}O_2^{16}$ and $C^{12}O^{16}O^{18}$ were determined in accordance with the theory of Adel and Dennison (Revs Modern Physics 12 175 (1940)). Observed infra-red solar spectrum values are compared with calculated values in tabular form and are found to be in good agreement. It is noted that the relative intensities of the lines observed are consistent with the generally accepted values for the abundances of C^{13} and O^{18}.

757 Isotopic Weights of Medium Elements by K Ogata Phys Rev 75 200-201 (1949) Jan 1

The isotopic weights of all the isotopes of Cr, Fe, Zn, and Br have been determined with a Bainbridge-Jordan type mass-spectrograph. Tabulated data are given for the observed doublets and the corresponding mass differences. From the latter, the isotopic weights, packing fractions and binding energies for the various isotopes were calculated; these are also given in tabular form. A curve of the packing fraction as a function of mass number is shown for the isotopes in the range Ti-Br. The packing fraction of the isotopes of the same elements differ considerably from each other. It is noted that in the four pairs of isobars, $Ti^{50} - Cr^{50}$, $Cr^{54} - Fe^{54}$, $Fe^{58} - Ni^{58}$, and $Ni^{64} - Zn^{64}$, the packing fraction of larger atomic number elements is always larger algebraically than that of small atomic number elements.

758 The Science Lecture in the High School Assembly II. Radioactive Isotopes by Harold J Abrahams School Sci Math 49 No.1 48-62 (1949) Jan

The author presents an elementary discussion of the production and use of radioactive isotopes. A simplified table of the periodic system of the elements is shown and tracer applications of C^{14}, Na^{24}, P^{32}, I^{131}, Fe^{55}, S^{35}, Cl^{36}, Au^{198}, K^{42}, Ca^{45} in biological studies are treated.

ISOTOPES SEPARATION

759 On the He^3 – He^4 Equilibrium below the λ-Point by C T Lane and Henry A Fairbank Phys Rev 75 46 – 50 (1949) Jan 1

Previous experiments attempting to establish the distribution of He^3 between the liquid and vapor phases of He^4, in the region below the λ-point, are discussed. It is pointed out that, because of the non-classical behavior of liquid helium II, customary methods of analysis fail. New measurements, using an entirely different kind of technique, are reported, and the results compared with prior determinations. The following results were obtained: $M_i/M_f = 62$, $C_i/C_f = 31$, $C_v/C_L = 1.9$ where M and C refer, respectively, to the liquid mass and the He^3/He^4 concentration and the subscripts "i", "f", "v", and "L" refer to the initial condition, final condition, and the vapor state and liquid state, respectively.

760 The Separation of Nuclear Isomers of Bromine on Silver Plates by W S Koski J Amer Chem Soc 70 4251-4252 (1948) Dec

This article is based on AECD-2262. An abstract of this document has been listed in Nuclear Science Abstracts as abstract No. I-1135.

METALS AND METALLURGY

761 Precision Investment Molding Process by J H Werniek. AECD-2439 (LADC-397) Mar 17 1947 Decl Jan 13 1949 32p

The "investment" or "lost wax" process is described briefly by the following essential steps: a master pattern of metal or some other suitable material is first made, differing in dimension from the desired part only in the allowances made for shrinkage. A wax replica is made of the master pattern, a separate wax pattern being required for each casting. A number of the wax patterns are mounted on a wax sprue and then imbedded in a semi-liquid refractory material retained by a metal cylinder. Air and excess liquid is eliminated from the investment material by vibrating, tamping or vacuum. After the mold has set, the wax is melted out of the mold leaving cavities of exactly the same shape and dimension as the wax pattern. The molds are then fired and may be used either hot or cold.

762 Conductivity and Hall Effect of Germanium (Leitfähighkeit und Hall-Effekt von Germanium) by Walter Ringer and Heinrich Welker Z Naturforsch 3a 20-29 (1948) Jan (In German)

In the experimental part of the present work measurements were made of the conductivity and the Hall effect of germanium and of its alloy with copper. The samples were prepared by fusion in high vacuum. Using the purest of the Ge preparations (about 0.001% impurities), the authors obtained the following data: specific resistance 0.86 ohm.cm, Hall constant 2000 cm^3/amp.sec. These values correspond to an electron concentration of 3.10^{15} cm^{-3} and an electron mobility of 2000 cm sec^{-1}/volt cm^{-1}. Since in preparations containing less than 0.1% admixtures the electron mobility is found to be constant, the conductivity in this region depends on the electron concentration alone, which in turn is proportional to the admixture content. A considerably higher specific resistance is therefore to be expected in a very pure preparation of Ge. In the theoretical part of the paper, the high electron mobility of Ge is given an interpretation based on the wave mechanical theory of metals.

763 Mechanical Working of Tantalum by Rupert H Myers Metallurgia 39 7-10 (1948) Nov

The techniques for swaging, rolling, and wire-drawing the metal, with particular reference to the problem of lubrication in drawing, are discussed. The effect of cold-working on the density is shown, and mention is made of a method of spot-welding it to itself and to other metals.

764 The Production of Lithium Metal by R R Rogers and G E Viens Can Mining and Met Bull 41 623-628 (1948) Nov

The following investigations of lithium and its alloys were conducted: (a) the electrolytic production of lithium alloys, (b) the production of high purity lithium by distillation from molten alloys at low pressure, (c) the corrosion resistance of certain of the alloys produced in the experiments. The

METALS AND METALLURGY (continued)

various procedures are discussed and the physical properties of lithium metal are given. It was concluded: Lithium alloys of lead, zinc, aluminum, and copper-aluminum can be produced quite readily by the electrolytic method. The electrolytic process for producing pure lithium is considerably more complicated.

Lithium alloys can be handled more readily and at less cost than pure lithium, both by the manufacturer and the consumer. On the basis of accelerated corrosion tests, it is believed that certain lithium alloys of zinc and of aluminum will be superior to the corresponding commercially pure metals as regards corrosion resistance.

765 Properties of Titanium Elec Mfg 43 No.1 120 (1949) Jan

An extensive study was made at the Bell Telephone Laboratories of the thermal and electrical properties of titanium and reported on in a paper before the American Institute of Mining and Metallurgical Engineers. The coefficient of expansion varied from 9 to 11 x 10^{-6} per degree Centigrade in the range from 30°C to 800°C (about the same as platinum and steel). The resistivity varied from about 16 to 165 microhm per cm over the range of temperatures from -200°C to 800°C, with a room temperature value of approximately 55 (about 30 times that of copper). The thermoelectric force against platinum was found to be zero at 0°C increasing to about 13 mv at 1000°C and was measured over the range from -200°C to 1000°C.

766 The Sintering of Electrolytic Tantalum Powder by Rupert H Myers Metallurgia 38 307-310 (1948) Oct

The effect of temperature and time of heating on some properties of pressed electrolytic tantalum powder is described. The work was carried out to determine the best conditions for sintering in order to study the workability and recrystallisation phenomena of tantalum rod and wire made by the powder process. As a result of this work it has been possible to prepare a sintering schedule for electrolytic tantalum powder which has yielded bars suitable for mechanical working.

767 Some Experiments on the Reaction of Titanium with Oxygen and Nitrogen by L G Carpenter and F R Reavell Metallurgia 39 No.230 63-65 (1948) Dec

Exploratory experiments are described which were carried out to determine the reaction ratio of titanium with oxygen and nitrogen at temperatures of 700° and 1,000°C. They were made in oxygen at about one-fifth and in nitrogen at about four-fifths of atmospheric pressure. It is evident that the rate of reaction of O_2 is much greater than that of N_2 and is increased by surface working. The films of oxide formed at 1,000°C are by no means protective but flake off easily. The oxide films formed at 700°C did not flake off, probably because they were extremely thin. The surface tarnish produced by N_2 was so slight that no question of flaking arose.

The rate of reaction, as shown by the pressure/time curve, is not very sensitive to O_2 or N_2 pressure, but it is not possible to draw precise conclusions as to the pressure dependence. In some of the O_2 experiments at 1,000°C rather abrupt changes of slope of the pressure/time curves appeared. This is probably connected with the formation of flaking layers of oxide. The initial rates of reaction appear to be reasonably constant from one specimen of titanium to another.

Using the kinetic theory of gases to compute the rate of molecular bombardment of the surfaces and comparing the result with the initial measured rate of reaction, the probability that a collision between a gas molecule and a titanium surface will result in reaction, under the conditions of temperature and pressure prevailing in these experiments, may be calculated. These probabilities are: 10^{-5} for O_2 at 1,000°C, 10^{-6} for O_2 at 740°C, and 10^{-8} for N_2 at 1,000°C.

768 Titanium---an Appraisal by Neville S Spence Light Metals 11 645-647 (1948) Dec

The article begins with a brief historical review of titanium which is followed by a presentation of physical and mechanical properties. Some probable uses of the metal, other than for reciprocating parts for turbines, are given.

MINERAL RESOURCES AND MINERALOGY

769 Fluorine in Industry Part I: Economic Aspects of Fluorspar by N T Hamrick and W H Voskuil Chem Inds 63 942-947 and 974 (1948) Dec

This paper deals with the production, uses, imports, exports, tariffs, consumption, and reserves of fluorspar, the raw material for fluorine. It is emphasized that due to the many uses fluorine will be put to in the future, a long-range view must be taken to assure locating new reserves, increasing imports, and finding an alternate source of fluorine that will be economically available before the demand depletes the domestic reserves. Statistics are given. 32 references.

770 Lithium Minerals in France (Les Minerais de Lithium en France) Génie Civil 125 436 (1948) Nov 15 (In French)

The minerals lepidolite (a complex silicate of aluminum, potassium, and lithium) and amblygonite (a fluophosphate of aluminum and lithium) are the best known for the recovery of lithium. Lepidolite is found at Ambazac (Haute-Vienne) and amblygonite at Montebras (Creuse). North of Ambazac, in the mountains of Saint-Sylvestre, a certain tonnage of beryl and some lepidolite are found. The contents do not exceed 4% lithium, but enough of the rock is present to justify extraction.

771 Uranium Minerals from the Hillside Mine, Yavapai County, Arizona by Joseph Axelrod, Frank Grimaldi, Charles Milton and K J Murata Bull Geol Soc Amer 59 1309 (1948) Dec

A mineral assemblage, forming coatings on gypsum at the 300-foot level of the Hillside mine, contains a variety of hitherto unknown uranium minerals, together with schroeckeringerite, previously known only from Wyoming and Czechoslavakia. The new minerals are bayleyite, $Mg_2UO_2(CO_3)_3 \cdot nH_2O$; andersonite, $Na_2CaUO_2(CO_3)_3 \cdot nH_2O$; and swartzite, $CaMgUO_2(CO_3)_3 \cdot nH_2O$. There are also two other new unnamed substances which are dehydration products of bayleyite and swartzite. Bayleyite, swartzite, and andersonite have been synthesized. Analyses, optical data, and X-ray patterns of the new minerals are given together with X-ray patterns of the dehydration products. Schroeckeringerite has been analyzed and its formula found to differ from that given in the older accounts in the literature; the analysis reported agrees closely with that of the Wyoming schroeckeringerite recently reported by Jaffe, Sherwood, and Peterson.

772 Uranium Ores of Haut-Katanga (Belgian Congo) (Les minerais d'uranium du haut Katanga (Congo belge) by Victor Charrin Génie Civil 125 475 (1948) Dec 15 (In French)

The uraniferous deposits at Shinkolobwe, high Katanga, Belgian Congo, have been further investigated. The location is favored by pleasant climate, suitable to the Continental worker, and the mineral resources seem inexhaustible. Uranium phosphates, lead uranates, and uranium oxides are found there without any particular order. Uraniferous minerals also exist in the copper mine of Luiswiski, near Elisabethville.

NEUTRONS

773 The Elastic Scattering of Fast Neutrons by Medium and Heavy Nuclei by E Amaldi, D Bocciarelli, B N Cacciapuoti and G C Trabacchi International Conference on Fundamental Particles and Low Temperatures Vol I 97-113. London, Physical Society 1947

The main purpose of the experiments described was to investigate the elastic scattering of fast neutrons due to the diffraction of the geometrical shadow of the nucleus and to compare the corresponding cross section σ_{es} with the cross section for formation of a compound nucleus σ_{cn}. The following measurements have been made using D + Li neutrons detected by means of the copper activity produced according to reaction $Cu^{63}(n,2n)Cu^{62}$(9.9 min) which has the threshold at about 11 Mev: (1) measurements of the total cross section $\sigma = \sigma_{es} + \sigma_{cn}$ (for 18 elements); (2) measurements of the cross section for absorption + inelastic scattering σ_a, which is expected to be slightly smaller than σ_{cn} (for four elements); (3) measurements of the angular distribution of the elastically scattered neutrons (in the case of Pb). In the four cases investigated (Al, Fe, Hg, Pb) σ_a turned out to be about one-half the total cross section σ, as expected theoretically. The differential cross section for elastic scattering has a

NEUTRONS (continued)

minimum at about 25° and a maximum at about 35-40°; from the position of the minimum it is possible to deduce a value of about 10^{-12} cm for the nuclear radius using a diffraction formula. The nuclear radii of the following elements are deduced from the measured values of the total cross section: Be, B, C, Mg, Al, S, Fe, Ni, Cu, Zn, Se, Ag, Cd, Sn, Sb, Au, Hg, Pb, and Bi.

774 Fission of Atomic Nuclei--II by B C Purkayastha Nucleonics 3 No.6 2-22 (1948) Dec

This is the second in a series of articles reviewing data available on nuclear fission. In addition to the chemistry of plutonium, the transuranates are discussed with the aid of a nuclear chart which demonstrates the usefulness of the isotope number in predicting properties of existing and missing isotopes.

775 On the Magnetic Moments of the Neutron and Proton by J M Luttinger Helv Phys Acta 21 483-496 (1948) (In English)

The author calculates the magnetic moment of a nucleon for the neutral, charged, and symmetrical pseudoscalar meson theory. The calculations are completely relativistic and the usual divergences are avoided by a method given by the author (Phys Rev 74 893 (1948)), yielding all finite results. The magnetic moments of the nucleons may be represented in the g^2 approximation by closed formulas. The theories do not give agreement with experimental values. It remains to be seen whether the error lies in the model (pseudoscalar mesons) or in the use of perturbation theory.

776 The Scattering of Fast Neutrons by Protons by C F Powell and G P S Occhialini International Conference on Fundamental Particles and Low Temperatures Vol I 150-166. London, Physical Society 1947

In continuation of previous experiments, observations have been made on the scattering of fast neutrons by protons, using the "half-tone" photographic emulsion for the detection of the recoil protons. The precision of the measurements has been improved, (a) by making exposures in conditions of refined geometry with emulsion 150 μ thick, and (b) by developing empirical methods of correcting for the escape of tracks from the emulsion, taking into account the small angle Coulomb scattering of the protons which result from collisions with the nuclei of silver and bromine atoms in the emulsion. This latter problem is important in connection with the application of the photographic method to the study of disintegrations produced by the very energetic particles now being generated artificially. If $I(\phi)$ represents the intensity, in the center-of-mass coordinate system, of the neutrons scattered by protons through the angle ϕ, the observed ratio $I(\pi)/I(\pi/2)$ is equal to 1.1 ± 0.1 for 9-Mev neutrons and 1.2 ± 0.2 for 13-Mev neutrons.

777 Total Cross Sections of Nuclei for 90-Mev Neutrons by L J Cook, E M McMillan J M Peterson and D C Sewell Phys Rev 75 7-14 (1949) Jan 1

This article is based on MDDC-1399. An abstract of this document has been listed in Abstracts of Declassified Documents 1 759 (1947) Dec 20.

NUCLEAR PROPERTIES

778 The Magnetic Moment of Aluminum^{27} by John R Zimmerman and Dudley Williams Phys Rev 75 198-199 (1949) Jan 1 (Letter to the editor)

Super-regenerative oscillator techniques (Phys Rev 73 94 (1948); 74 1885 (1948)) have been used to observe magnetic resonances of Al^{27} in aqueous solutions of the salts $AlCl_3$ and $Al_2(SO_4)_3$. The preliminary results obtained are in agreement with Millman and Kusch's value for the magnetic moment of Al^{27} of $3,628 \pm 0.010$ nuclear magnetons (Phys Rev 56 303 (1939)). A more detailed report will be given later.

NUCLEAR PROPERTIES (continued)

779 Note on Nuclear Magnetic Resonance by E E Schneider Proc Phys Soc 61 569-571 (1948) Dec 1

A general method suitable for the detection of feeble nuclear magnetic resonances, and which may be useful in the absolute measurement of relaxation times, is described. The method is one in which the discrimination against noise is increased by utilizing the extreme frequency selectivity of a continuously oscillating system maintained by non-linear regeneration. A diagram of a system applying this method to the study of nuclear magnetic resonances is shown.

780 Nuclear Magnetism in Studies of Molecular Structure and Rotation in Solids: Ammonium Salts by H S Gutowsky and G E Pake J Chem Phys 16 1164-1165 (1948) Dec (Letter to the editor)

The authors investigated the width and structure of nuclear resonance absorption lines of eleven ammonium salt powders between 90°K and room temperature. A curve of line width versus temperature is given for NH_4Cl as are experimental absorption curves for the proton line in NH_4Cl crystal powder at 95°K and 295°K. It should be noted that line width here is taken to be the width in gauss between points of maximum and minimum slope on the absorption curve. The line width at temperatures just above the transition region is accounted for by assuming hindered rotation or quantum-mechanical tunneling of the NH_4 tetrahedra at around 100 kilocycles.

781 A Quantitative Discussion of the Interaction Between Nuclear Particles by H Fröhlich, W H Ramsey and I N Sneddon International Conference on Fundamental Particles and Low Temperatures Vol. I 166-175 London, Physical Society 1947

The static Møller-Rosenfeld theory is used to calculate the binding energies of H^2, H^3, He^3, and He^4, as well as the angular distribution of neutron-proton scattering. The three parameters available in the theory (one of them is the meson mass) are obtained from a comparison with the experimental binding energies of the H^2 (singlet and triplet) and H^3 nuclei. The meson mass m is found to be 225 electron masses, which is in agreement with the existing experimental data which are centered near m = 200. The energy difference between He^3 and H^3 is also found to be in good agreement with the experimental value.

For He^4 the theoretical binding energy is less than half of the experimental value. It is shown, however, that an additional attractive force amounting to about 15% of the static force would lead to the correct binding energy. It is found that this could not be obtained by slight ($\sim$ 15%) change in the values of the parameters, and it is suggested that such a force might indicate the existance of many-body forces which would be more important for He^4 than for H^3. The angular dependence of the neutron-proton scattering is found to agree with the experiments by Occhialini and Powell (1946), but the accuracy of the experiments does not, at present, permit a final conclusion about the validity of the theory.

NUCLEAR TRANSFORMATION

782 The Fission of Thorium with Alpha-Particles by A S Newton Phys Rev 75 17-29 (1949) Jan 1

This article is based on AECD-2194. An abstract of this document has been listed in Nuclear Science Abstracts as Abstract No. I-1009.

783 Threshold and Resonances in $C^{14}(p,n)N^{14}$ Reaction and Energy Levels of N^{15} by W E Shoupp, B Jennings and K H Sun Phys Rev 75 1-7 (1949) Jan 1

The threshold energy required to induce the (p,n) reaction in C^{14} has been measured to be $E_t = 0.664 \pm 0.009$ Mev or a reaction energy of -0.620 ± 0.009 Mev. This reaction is the inverse of the $N^{14}(n,p)C^{14}$ process studied by Hughes and Eggler (Phys Rev 73 809 (1948)) and their observed reaction energy $Q_{n,p} = 0.597 \pm 0.009$ Mev can be compared with the negative of the reaction energy observed here. Six resonances have been observed in the process at 1.14, 1.30, 1.47, 2.05, 2.21, and

NUCLEAR TRANSFORMATION (continued)

2.65 Mev, three of which can be correlated with those previously observed in the $N^{14}(n,p)$ reaction. The cross section at the first resonance at 1.14 Mev has been measured to be approximately 0.7 barn.

PARTICLE ACCELERATORS

784 Apparatus for Automatic Synchronization of the Cyclotron (Dispositif de Synchronisation Automatique du Cyclotron) by Pierre Debraine and Cestmir Simane J Phys et Radium 9 113-121 (1948) Apr (In French)

The object of this study is the construction of an apparatus for synchronization of the cyclotron which will achieve the greatest possible regularity in the functioning of the latter. The apparatus developed has two components. The first part is a magnetic field regulator of such character that it is easily possible to control the position of regulation by variation of a voltage applied to the gap. The second component is a device facilitating control of the regulator in order to make a continuous examination of the magnetic field, carrying out an inspection of the reactions to find the intensity of the ion beam; the mean value of the magnetic field is caused to vary in the desired direction so that stabilization is obtained at the value of the magnetic field giving the maximum beam. This stabilization depends only on reaching the maximum; there is no other factor which is involved. A detailed circuit diagram of the automatic synchronizer is shown.

785 Validity of Two-Dimensional Design of Synchrotron Pole-Faces by F K Goward and J J Wilkins Proc Phys Soc 61 580-582 (1948) Dec 1 (Letter to the editor)

The validity of the 2-dimensional synchrotron pole-face design recently outlined by Davy (Proc Phys Soc 60 598 (1948)) is considered. Instead of calculating the exact profile, the authors compare the 2-dimensional measurements in an electrolytic tank with measurements on a 3 dimensional magnet. The results obtained for a 30 and a 375 Mev synchrotron are shown. The former gives the greatest divergence between the 2- and 3-dimensional measurements which is likely to be met in practice; the pole face extends over a radial distance of more than half the equilibrium orbit radium and θ takes values up to 20°. By comparison only a slight discrepancy between the two cases is indicated for higher energy machines; this is illustrated by the results shown for the 375 Mev machine.

PHYSICS, GENERAL

786 Absolute Zero Approached Chem and Eng News 26 3705 (1948) Dec 13

Temperatures as low as five one-hundredths of a degree above absolute zero have been achieved at Ohio State University. Plans have been made for construction of a nuclear cryogenic generator with which temperatures estimated at one part in a million above the absolute zero may be attained. This will facilitate studies of nuclear problems at temperatures where molecular and atomic motions are practically frozen out.

787 Emission of Secondary Electrons from Nickel and Molybdenum by Neutral Atoms of Mercury and Potassium by R M Chaudhri and A W Khan Proc Phys Soc 61 526-531 (1948) Dec 1

Investigations have been carried out on the emission of secondary electrons from Ni and Mo produced by high speed neutral atoms of mercury and potassium. The mercury particles were produced by neutralizing a homogeneous beam of accelerated ions from a hot-cathode mercury arc on the walls of a narrow nickel canal which they strike at grazing incidence. The neutral atoms of potassium were produced by passing a beam of fast ions of definite velocities through vapors of potassium where they were neutralized by electron exchange with neutral K atoms. It is observed that the secondary emission rises with the number and the energy of the particles and that the energy distribution among the secondary electrons is always Maxwellian, suggesting that the emission is probably due to intense local heating. The effective temperatures of the target have been calculated for typical conditions.

PHYSICS, GENERAL (continued)

788 From the Electron to the Photon (De l'électron au photon) by J Pommet Paris, Gauthier-Villars, 1948. 1 vol 92p 35 fig (Editions toulousaines de l'ingénieur)

The laws of electricity and of light are compared preliminary to the discussion of the relationship between mass and energy.

789 High Magnetic Fields by Martyn H Foss. Carnegie Institute of Technology (Office of Naval Research Contract) Technical Report No. 3 nd 19p (M-4278)

Obtaining very high magnetic fields, several million gauss, is physically possible. The limitation is the large power requirement. A good background for the design of practical magnets is found in the study of an "ideal" magnet which has the optimum current density of distribution. Two designs of coils are discussed. The first comes close to the optimum and the second makes the region where the field is developed very accessible. It is shown that it is possible to closely approach the best that can be done with relatively simple designs. However the designs discussed are not in a form suitable for construction. Determining the design of a coil which has zones bounded by planes of constant (r) and constant (Z) (cylindrical coordinates) depends on the solution of simulataneous transcendental equations which could be undertaken for each design but not in a general treatment. The maximum current density which can be used is an important factor in coil design. This quantity must be determined experimentally before any design can be completed. The use of silver as the conductor in the central region of a coil may be worth while under some circumstances, as also may be cooling with liquid air.

790 On the Motion of Ions in the Plasma (O Dvizhenii Ionov v Plazme) by V A Fok Z Eksptl 'noi i Teoret Fiziki 18 1049-1055 (1948) Nov (In Russian)

In an experimental study of the intensity distribution of light emitted by ions moving with a given velocity in the plasma, Frish and Kagan (Z Eksptl 'noi i Teoret Fiziki 17 577 (1947)) used formulas which had been obtained by the author. In the present paper the derivation of the formulas is given. Approximate expressions are thus obtained for the velocity distribution of ions in the plasma, and for the interval of time dT during which an ion's velocity lies between the values v and v + dv. Since dT is proportional to dv, dT = Rdv; R is expressed as an integral, of which an approximate solution is given.

791 On the Reflection-Transmission Effect in Experiments on Polarization of Electrons by L J F Broer Phys Rev 74 1887-1888 (1948) Dec 15 (Letter to the editor)

The contention of Shull, Chase, and Myers (Phys Rev 63 29 (1943)), that the discrepancy between their measurements on the polarization of electron beams and the earlier attempts (Dymond, Proc Roy Soc 145A 657 (1934); Thomson, Phil Mag 17 1058 (1934); Richter, Annalen der Physik 28 533 (1937)) to find this effect can be attributed to the so-called "transmission-reflection" effect of Chase and Cox (Phys Rev 58 243 (1940)), is discussed. It is concluded that the results of Shull, et al. seem to disagree with those of Dymond, Thomson, and Richter as well as with the theory of the reflection-transmission effect given by Goertzel and Cox (Phys Rev 63 37 (1943)).

792 Permanent Magnets by J L Salpeter J Brit Inst Radio Engrs 8 211-249 (1948) Sept-Oct

This review of the theory of magnetism as applied to permanent magnets includes some of the theorems of magnetostatics necessary for the understanding of the demagnetization curve of a permanent magnet. Langevin's classical theory of paramagnetism and Weiss's theory of ferromagnetism are discussed, and the wave mechanical significance of Weiss's intramolecular field is presented non-mathematically. The spontaneous magnetization is given as a function of the atomic magnetic moment and the Curie temperature. After discussing magnetostriction and defining magnetic power, the author discusses magnetic anisotropy and hysteresis. The hardness of metals is also treated with respect to magnetic properties, and the effects produced by adding silicon and carbon are described. The magnetic and hardening properties of dispersion hardening alloys are treated, and

PHYSICS, GENERAL (continued)

transition zones and Bloch's theory of coercivity are explained by means of a model. Finally the author discusses the effects of cooling in a magnetic field and the magneto-thermal treatment for improving the fullness factor. 39 figures and 20 references.

793 Proceedings of the American Physical Society Phys Rev 75 215-216 (1949) Jan 1

The thirty-first meeting of the New England Section of the American Physical Society was held at Bowdoin College, Brunswick, Maine, on Saturday, October 23, 1948. Abstracts of the following papers are given: Precise Measurements of the Molar Refraction of Carbon Dioxide and Its Variation with Density, by Victor H Coffin and Clarence E Bennett; A Method of Measurement of Small Periodic Displacements and Its Application to Determining the Piezoelectric Constants of Potassium Dihydrogen Arsenate, by Thaddeus Niemiec; Fringing Field Corrections for Magnetic Sector Lenses and Prisms by Kenneth T Bainbridge. In addition the following invited papers were presented: Isotopic Weights, by K T Bainbridge; Fluid Properties of Liquid Helium, by A D Misener; The Helium Three Isotope at Liquid Helium Temperature, by H A Fairbank; The Surface Resistance of Superconductors at Microwave Frequencies, by W M Fairbank.

794 The Secondary Emission of Electrons by High Energy Electrons by J G Trump and R J Van de Graaff Phys Rev 75 44-45 (1949) Jan 1

The secondary emission of electrons from tungsten, steel, aluminum, and graphite was studied as a function of the energy of the bombarding primary electrons in the range of from 30 kilovolts to 340 kilovolts. The ratio of secondary to primary electrons was found to diminish with increasing primary energy and to increase with the atomic number of the target material. Thus, with aluminum the ratio diminished from 0.25 at 50 kilovolts to 0.17 at 200 kilovolts, while with tungsten it diminished from 0.73 to 0.62 in the same voltage range. Study of the energy distribution of the secondary electrons showed a percentage with energies less than 20 volts. Most of the remainder had energies greater than the available 800-volt repressor potential and resulted mainly from elastic nuclear scattering, particularly in the case of targets of high atomic number. Data curves are given.

795 The Ultimate Standard of Length by William F Meggers Scientific Monthly 68 3-11 (1949) Jan

The author discusses the advantages of using the 5461 A (green) line in the spectrum of the isotope Hg^{198} which has been produced by neutron bombardment of gold as the ultimate standard of length. Previously it has not been possible to use mercury for this purpose since it was not practical to isolate or concentrate a single isotope of natural mercury in sufficient quantities to make lamps. The homogeneity, reproducibility, and convenience of this standard are discussed and compared with those of the cadmium red line. It is concluded that the superiority of this mercury line as the ultimate standard of length should be recognized by defining the meter in terms of the green line in the Hg^{198} spectrum.

PHYSICS, NUCLEAR

796 Atomic Structure by R E Lapp and H L Andrews Proc Inst Radio Engrs 36 1070-1080 (1948) Sept

This paper contains the basic information, usually seen in college textbooks on physics, on Rutherford's scattering experiments, the derived Rutherford model of the atom, a discussion of the electrical nature of matter, the periodic table, the fundamental theories on atomic spectra and energy levels, and the Bohr atom, and is apparently designed to acquaint the electrical engineer with the fundamental theories in connection with the structure of matter. An appendix contains discussions on the fundamental properties of waves and the quantum nature of electromagnetic waves.

PHYSICS, NUCLEAR (continued)

797 Atoms on Parade by Anthony Edwards Science and Mechanics 19 No.5 81-85 (1948) Dec

The present development of "atom-smashers" is discussed; the various types of atom smashers and the fundamental particles are compared in tabular form. Present applications of radioactive tracers and possible future applications of atomic energy are shown. The author also notes the possibility of developing a device which he refers to as an "atomicmateria teletransporter" which will transport objects by molecularly disintegrating them at the origin of the trip and reassembling them at their destination.

798 Introduction to the Study of Nuclear Chemistry (Introduccion al Estudio de la Quimica Nuclear) by Juan Sancho Gomez. Murcia, Spain, La Universidad de Murcia 1948 292p (In Spanish)

This book is divided into eleven chapters: Structure of Matter, Properties of Nuclei, Methods of Detection of Particles, Methods of Particle Acceleration, Radioactivity, Particles and Radiations, Nuclear Reactions, Nuclear Fission, Applications of Nuclear Chemistry, Theory of the Nucleus, and Table of Isotopes. The chapters are divided into logical subdividsions, and the material is treated in a general, mostly non-theoretical manner with the greatest stress being placed upon applications, particularly recent ones. An appendix contains limited information on the atomic bomb up to the experiments at Bikini.

799 Nuclear Physics and Low Temperatures by M E Rose Nucleonics 3 No.6 23-31 (1948) Dec

Recent developments in nuclear physics and in low temperature physics which are inter-related are discussed. Some of the problems and techniques common to both fields of research are described; in particular the production and utilization of nuclei with aligned spins is treated.

PHYSICS, NUCLEAR - METHODS OF MEASURING

800 Applications of Electronics to Research and Industry The Engineer 186 481 (1948) Nov 12

The Scientific Instrument Manufacturers' Association of Great Britain held a symposium on "The Applications of Electronics to Research and Industry" in London on November 18-19. The following were among the topics discussed: Electronics on Computing, A Review of Frequency Measurement, The Measurement of Small Displacements by Electric and Electronic Methods, Measurement of Ionizing Radiations, High-Vacuum Gauges, Electronics in Spectroscopy, Some Applications in Picture Telegraphy.

801 Atomic Blinker Rev Sci Instruments 19 926 (1948) Dec

The Radiation Counter Laboratories announce a lightweight (2 1/4 lb), low cost portable radiation detector, the semiquantitative "atomic blinker." The instrument contains a thin-wall β-counter for detecting beta, gamma, and X-radiation with a total window thickness of 30 mg/cm^2. Each ionizing event is indicated by the flashing of a lamp.

802 Cloud Chamber Coils by Martyn H Foss. Carnegie Institute of Technology (Office of Naval Research Contract) Technical Report No.2 nd 15p (M-4277)

The field coils for a cloud chamber are required to have no windings over the "midplane" in which the chamber is located and are required to produce a uniform field. In this paper, the problem of producing a uniform field by Helmholtz type coils is considered. Helmholtz coils have a cross-section small in comparison with their radius squared, and thus require excessive power where a high field is required. The coils considered have cross-sections comparable with their radius squared and have reasonable power requirements. It is clear that any uniformity condition can be met by making the coils sufficiently large. However, this approach results in bulky inefficient coils. This problem of the uniformity of the field is therefore studied by making a power series expansion in

PHYSICS, NUCLEAR - METHODS OF MEASURING (continued)

terms of the radius of the field point in the midplane. This power series can be developed from the expression for the field of a loop of wire. From the theory and calculations two coil designs are developed. Specific examples of each are indicated.

803 Diamonds Used to Detect Atomic Radiation Metallurgia 39 10 (1948) Nov

A report by the National Bureau of Standards states that diamonds are highly sensitive to gamma rays and may be used to detect this radiation in the same way as a Geiger-Müller counter. The diamond counter is very "fast" and capable of indicating many more pulses per minute than is the ordinary Geiger-Müller counter. Important advantages of the diamond counter are sensitivity, long life, and its small size, permitting use inside the human body or in small openings in industrial equipment. Diamond counters are practically indestructible and there is no appreciable cost difference between the diamond and the ordinary counter. The diamond counter has not been tested for β-radiation yet, but it is expected that a similar effect may be observed in this case.

804 Effect of Absorber Position on Counting Rate of Collimated and Uncollimated Beta and Gamma Radiation by Francis Johnston and John E Willard Science 109 11-12 (1949) Jan 7

Tabulated data are presented which indicate that the counting rate for beta and gamma radiation is appreciably dependent upon the position of an absorber foil placed between a fixed sample and a detector. In addition it has been noted that a variation in absorber position in a collimated beam of radiation may have an effect opposite to that of a similar variation in position using uncollimated radiation. The author explains the latter effect with the aid of schematic diagrams.

805 The Flash Tube and Its Applications by J N Aldington and A J Meadowcroft J Inst Elec Engrs 95 Part II 671-681 (1948) Dec

The author discusses the flash tube, its construction and characteristics, the associated circuits used with it, and some of its applications. One of the applications treated is the use of such tubes in photographing ion tracks in Wilson cloud chambers.

806 General Theory of the Methods of Measurement of X-Rays (Théorie Générale des Méthodes de Mesure des Rayons X) by H Tellez-Plasencia J Phys et Radium 9 230-235 (1948) July-Aug-Sept (In French)

The methods of measurement of the quantity or of the intensity of X-radiation actually indicate the energy transformed in the receptor organ, which produces an effect there which is either thermal or ionizing. The intermediary agents of these phenomena are the electrons liberated by the Compton effect or by the photoelectric effect. The theoretical balance between these processes has been studied for the case of several receptors in use, and permits the prediction of the relation between the energy transported by the beam and the magnitude measured directly, i.e., the quantity of electricity produced by the ionization in the chambers or counters, the blackening of the photographic plate, etc.

807 An Inexpensive Filter-Cup for Collecting and Counting Active Precipitates by Elliott L Abers Nucleonics 3 No.4 43-44 (1948) Oct

Small aluminum and copper cups, about 22 mm in diameter and 5 mm deep, with a 2 cc capcity may be adapted for filtration and mounting of radioactive precipitates by drilling small, 1 mm holes into them and connecting to a filter flask by a rubber ring, thus giving small Buchner type funnels. For finely divided precipitates like fresh barium sulfate, the loss was found to be approximately 1%.

808 Measurement of P^{32} and I^{131} Radiations with Dental Film by F Hermann Rudenberg, Russell F Cowing and Charles K Spalding Nucleonics 3 No.6 52-59 (1948) Dec

This study was made to find "known" values with which the densitometer readings of monitor films exposed to unknown amounts of radiation could be compared. Conditions were made as much

PHYSICS, NUCLEAR - METHODS OF MEASURING (continued)

like those found in laboratories as possible. Accuracy within ±10% in the determination of phosphorus and iodine radiation dosage was obtained by this establishment of net density versus roentgen relationship for monitor-type dental film.

809 Note on the Photo-Conductivity of Cadmium Sulfide Crystals by Rudolf Frerichs and A J F Siegert Phys Rev 74 1875 (1948) Dec 15 (Letter to the editor)

The authors discuss a qualitative theory which explains the high photo-currents observed when CdS crystals are irradiated with alpha, beta, or gamma rays or light; such currents are 100 to 10^4 times larger than the total charge brought up per second to the conduction band by the radiation. According to the suggested theory of "trapping" of electrons, at a sufficiently low temperature the electrons should be delayed in leaving the crystal. Such a delay in the rise of conductivity has been observed at liquid air temperature. It was found that a crystal of CdS, which had been kept in the dark a sufficiently long time, reached a resistance much greater then 3×10^{13} ohms when cooled to -189°C. If at t = 0 irradiation with a constant gamma-ray intensity is initiated, the following resistance changes occur

t(sec)	0	3	36	72	132	
R(ohms)	$\gg 3 \times 10^{13}$	3×10^{12}	3×10^{12}	4×10^{10}	2×10^{8}	(saturation value)

Only a small field voltage (2.9 volts/mm) was applied to avoid ionization effects. If the irradiation is interrupted after 36 seconds, the crystal can be kept in this "metastable" state at -189°C for a long time.

810 Nuclear Disintegration Schemes and the Coincidence Method by C E Mandeville and M V Scherb Nucleonics 3 2-12 (1948) Oct

The author discusses counter arrangements suitable for coincidence counting of beta-gamma, gamma-gamma, and beta-beta coincidences. Some of the counter arrangements and typical data obtained are shown along with a diagram of a fast coincidence circuit. The utilization of such data in the determination of the decay schemes of radioactive nuclei is described.

811 On the Effect of α-Radiation upon the Activation of a ZnSCu phosphor (Über die Wirkung von α-Bestrahlung auf die Anklingung eines ZnSCu-Phosphors) by Fritz Bandow Z Naturforsch 3a 16-20 (1948) Jan (In German)

Using a ZnSCu phosphor called "Green N," the author measured $A = L_t/(L_\infty t)$, where L_t is the total light emitted by the phosphor after t sec excitation by a certain light source, and L_∞ is the total light emitted after the excitation had lasted long enough to produce no further effect. The effect of α-irradiation of the phosphor is to reduce A. This phenomenon is found to depend on the excitation state of the long-continuing centers: when these are not excited, the activation of the transient centers is greatly retarded.

812 Progress Report on Nuclear Physics Research by C E Falk and E Baldwin. Carnegie Institute of Technology (Office of Naval Research Contract) nd 7p (M-4279)

A report is submitted on the progress and present status of experiments and apparatus to study angular distributions of neutrons from (d,n) reactions, neutron scattering cross-sections, and neutron energy spectra. Fundamentally, the same type of apparatus will be used for all the experiments mentioned above, namely a "Proton Energy Analyzer". This consists of a 77 cm evacuated brass tube with a cellophane window at one end and a small aluminum foil on the other; immediately following the tube is a brass chamber which contains three proportional counters made of 1.27 cm I.D. brass cylinders and axial 3.7 mil wires which have small holes in the brass wall. Foils of various thicknesses can be put in front of the first and third counters. It was found that in order to get neutron fluxes of high energies, lithium targets were undesirable for cyclotron bombardment because they would stand only small deutron currents and even then had a tendency to sputter. For this reason

PHYSICS, NUCLEAR - METHODS OF MEASURING (continued)

B_4C targets, which when bombarded with 16.0 Mev deuterons yield up to about 30 Mev neutrons from the $B^{11}(d,n)C^{12}$ reaction, were tried and were found fairly successful. It was decided to use a fission ionization chamber (thorium) as a monitor.

813 "Q-Gas" Geiger Counter Rev Sci Instruments 19 926 (1948) Dec

A new Geiger counter especially designed for the detection of soft ionizing radiation is announced by the Nuclear Instrument and Chemical Corporation. The counter contains the gaseous mixture "Q-gas" which permits operation at atmospheric pressure over a wide temperature range with an anode potential of only 1450 volts. The counter may be used for the detection of α-particles, gamma radiations, and both hard and very soft β-radiation, with high efficiency. Discrimate counting can be accomplished by the use of absorbers in the built-in shelf.

814 Recording of Charged Particles of Minimum Ionizing Power in Photographic Emulsions by R W Berriman Nature 162 992-993 (1948) Dec 25

Photomicrographs taken from gamma-ray experiments on 200-micron thick coatings of an experimental emulsion are shown. The electron tracks shown vary in length from 240-23,200μ indicating that the tracks of electrons of lower ionizing power than have heretofore been recorded, were involved. The energy of an electron having a velocity about 90% that of the velocity of light has the lowest ionizing power that a charged particle can possess; its energy in such a case lies in the 500-1000 Kev range and the residual path length of such an electron is 800-2000μ for an emulsion stopping power of 2000. The present commercially available electron-sensitive plates (Kodak NT2a) will record for electron energies up to 80 Kev (30μ track-length).

815 Survey of Methods for Detection and Measurement of Ionizing Radiations by L M Garrett Texas State J Med 44 580-583 (1948) Dec

The importance to radiologists of a thorough knowledge of the fundamentals underlying the measurement of ionizing radiations in experimental tracer work and in the event of atomic warfare is pointed out. The basic principles of the various methods of measurement are discussed. The methods included are: (1) photographic, (2) ionization chambers, including simple, proportional, and Geiger counters, and (3) miscellaneous, including the diamond counters and the zinc sulfide counters.

816 Theory and Operation of Geiger-Müller Counters -- III. The Circuits by Sanborn C Brown Nucleonics 3 No.4 46-61 (1948) Oct

The various types of external circuits commonly associated with G-M counter operation are diagrammed and described. Included in the discussion are the following: preamplifiers, coincidence circuits, high voltage circuits, battery-operated supplies, scalars, integrating circuits and recorders. 25 figures, 28 references.

817 Three-Dimensional Oscillograph System by James L Whittaker, Princeton N. J., assignor to Radio Corporation of America, Delaware. U. S. Patent No. 2,455,456 Dec 7 1948

The author has developed a three-dimensional oscillograph system wherein three means are provided for applying potentials to the control elements in such a manner as to give an indication in true geometric perspective indicative of three variables. The potentials indicative of two of three variables under consideration are applied to the deflecting elements of two cathode ray tubes. Both of these potentials are then varied in the same sense in inverse proportion to the third variable, and corresponding ones of the two potentials are varied in the opposite sense to the third variable. The resultant images viewed stereoptically give an apparent angle in true geometric perspective.

PHYSICS, THEORETICAL

818 Derivation of Fundamental Kinetic Equation in Quantum Mechanics by S Vonsovsky J Phys (USSR) 10 367-376 (1946)

In order that a quantum-mechanical ensemble might obey the kinetic equation, it is necessary to fulfil the following conditions: (1) The quantum transitions in the ensemble must be of such a nature that in carrying out a certain averaging the non-diagonal matrix elements of the statistical operator of the given ensemble retain their zero value (or at least they afford no contributions in computing the mean values of the observable quantities). (2) It is necessary to carry out an averaging, firstly, over the states close to resonance transitions and, secondly, over time $t \gg h/\Delta E = \Delta \tau$ (ΔE is the energy difference between any two states for which the quantum-mechanical probability of transition is different from zero, $\Delta \tau$ is the "duration of collision"). (3) It is necessary to set forth the requirements similar to the principle of detail equilibrium (the classical Stosszahlansatz) which is reduced to the form $U(q\zeta) = \alpha(q)\ \beta(\zeta)$ for the statistical operator $U(q\zeta)$ of two interacting systems for any initial moment of time, although this contradicts the quantum-mechanical equations of motions.

819 Equations for Particles of Higher Spin by Harish-Chamdra International Conference on Fundamental Particles and Low Temperatures Vol. I 185-188. London, Physical Society 1947

The theory of elementary particles based on a linear wave equation with matrix coefficients is developed, and the physical assumptions regarding such a particle are translated into algebraic restrictions on these coefficient matrices. As an illustration, the theory is applied by considering a special case, which corresponds to a particle with spin values 3/2 and 1/2.

820 Further Investigations on Heisenberg's Characteristic Matrix by N Hu Proc Royal Irish Acad 52A 51-68 (1948) Nov

Previous investigations of Heisenberg's characteristic S-matrix have been made using the method of analytic continuation for systems of a fixed number of particles (Ma, Phys Rev 69 668 (1946); 71 195 (1947); Haar, Physica 12 501 (1946)). The author attempts to apply the method of analytic continuation to a system in which the number of particles is not fixed; i.e., a complete S-matrix allowing for the creation and annihilation of particles is used. It is found, however, that the general form of such a complete S-matrix is only a piece — wise analytic function of the total energy E in the continuous spectrum; i.e., when E is greater then m_1, the rest mass of the lightest particle considered apart from the scattering center. There is, therefore, no sense in continuing S analytically to the region of the closed states where E is less than m_1, unless some modification is introduced to make it analytic in the whole scattering region. Unfortunately this leads to the same negative energy difficulty which existed before the introduction of the second quantization. A direct consequence of the appearance of negative energy states is the conclusion that no permanent closed states will be possible. The results obtained suggest that the complete S-matrix cannot be analytic and that the method can only be applied successfully to the approximation in which the number of particles is considered as fixed.

821 The Magnetic Internal Conversion Coefficient by S D Drell Phys Rev 75 132-136 (1949) Jan 1

The magnetic internal conversion coefficient for K-electrons is rederived with the Dirac current for the electron introduced into the electron-nucleus interaction matrix. In addition to resolving a discrepancy found in the literature, the formula obtained indicates that magnetic conversion is an effect of importance comparable with electric conversion. The influence of the magnetic conversion on the total conversion coefficient, on the K- to L-shell conversion ratio, and on the lifetimes of isomeric levels is discussed.

PHYSICS, THEORETICAL (continued)

822 The Metric of Space and Mass Deficiency by A M Mosharrafa Phil Mag 39 728-738 (1948) Sept

A new metric of space-time, which is a generalized form of the Riemannian metric, is introduced in the theory of relativity. The world-line of a charged particle is shown to be a geodesic, and the equations of motion of the particle are obtained. Using the metric, the mass of a particle can be expressed as a function of its potential energy. The mass deficiency of nuclei is thus explained as arising from the presence of their charged components in the nuclear field, and the potential of their nuclear fields is determined from exact mass measurements for isotopes at 37 different elements, i.e., H, He, Li, Be, B, C, N, O, F, Ne, Al, Si, P, S, Cl, A, Sc, Cr, Ni, Zn, As, Se, Br, Kr, Nb, Mo, Rh, Sb, I, Xe, Cs, Ba, Ta, Re, Os, Hg, and Tl. The calculated values for the effective radii are found to agree with results obtained by Gamow from radioactive data. The mass of an electron in a nuclear field indicates that β-disintegration is more like the emission of field energy than particle ejection, and it is noted that the mass of a positron becomes very small in the neighborhood of nuclei. A curve is drawn from the data to represent the growth of potential with atomic number Z which reaches a value of about 20 million volts at Z = 81.

823 Note on the Bremsstrahlung Produced by Protons by John L Powell Phys Rev 75 32-34 (1949) Jan 1

The bremsstrahlung produced by protons is discussed on the assumption that the anomalous magnetic moment can be described in terms of a Pauli type interaction with the electromagnetic field. (W Pauli in Handbuch der Physik, Berlin, Julius Springer 1933, Vol XXIV/1, p 233). The result of a perturbation theoretical calculation of the cross section is given, and a comparison is made with the approximate method of Weizsäcker (Z Physik 88 612 (1934)) and Williams (Phys Rev 45 729 (1934)). Reasons are given for the failure of the Weizsäcker method in special cases.

824 A Note on the One-Electron States of Diatomic Molecules by Henry A Erikson and E L Hill Phys Rev 75 29-31 (1949) Jan 1

The explicit formulation of an integral of the motion is given for a single electron moving in the field of two fixed nuclei, for both the classical and the quantum mechanical cases. The corresponding quantal operator together with the Schrödinger Hamiltonian and the operator for the component of the orbital angular momentum of the electron about the internuclear axis form a complete set of commuting observables of the problem. This supplies the dynamical interpretation of the separation parameter of the energy equation.

825 On a Certain Criterion of Relativistic Invariance by M Markov J Phys (USSR) 10 333-340 (1946)

Various attempts to remove well known field theory difficulties have been proposed recently. A critical analysis shows that if one does not reject the space-time description, it is necessary to require that between two events lying outside the light cone, that is, if $c(t - T) < |\underline{r} - \underline{R}|$, there should be no casual connection:

$$\frac{\partial A'(T,\underline{R})}{\partial t} = \left[H(t,\underline{r}),\ A'(T,\underline{R})\right] = 0 \qquad (1)$$

(In the Poisson bracket of (1) the Hamiltonian $H(t,\underline{r})$ is taken at the moment t at point $\underline{r}$, and $A'(T,\underline{R})$ corresponds to a vector potential taken at the moment $T \neq t$ and the point $\underline{R} \neq \underline{r}$.) Relativistic invariance of the Hamilton-Jacobi equation or the quantum equations of motion does not automatically lead to the fulfilment of requirement (1). Certain attempts to inroduce into the Hamilton function in a relativistically invariant manner a "fundamental length" do not satisfy this criterion. In the investigation of this problem, it is convenient to apply Dirac's many-time formalism; in this case condition (1) is connected with the condition of existence of a ψ-function, i.e., of a solution for the corresponding system of differential equations. Various λ-limiting processes and the Hamilton form equivalent to the Heitler-Peng "calculation scheme" are studied from the point of view of criterion (1).

PHYSICS, THEORETICAL (continued)

826 On the Wave Equation for a Particle of Total Maximum Spin h/2π Having Several Mass States (Sur l'Équation d'Ondes du Corpuscule de Spin Total Maximum h/2π Possédant Plusieurs États de Masse) by Gérard Petiau J Phys le Radium 9 245-248 (1948) July-Aug-Sept (In French)

The method introduced by M. Van Isacker (Compt Rend 224 1758-1760 June 23 (1947)), allowing for the assumption of the different coefficients of characteristic mass for the different irreducible representations of the wave equations for a particle of total maximum spin h/2π, is extended to the case where the system of matrices characterizing the particle is defined in a five-dimensional space. It is shown that for this case it is possible to obtain a general wave equation whose irreducible representations correspond to a Møller-Rosenfeld meson of mass m_1 which is both vectorial and pseudoscalar, to a scalar meson of mass m_2, to a vectorial meson of mass m_3, and to a pseudo-vectorial meson of mass m_4. The method used also allows for the association of electric charge states or different characteristic electromagnetic moments with the various irreducible representations.

827 Pair Formation by a Photon and the Decelerating Radiation in an Electron Field (Obrazovanie Par Fotonom i Tormoznoe Izluchenie v Pole Elektrona) by P E Nemirovskiĭ. Zhur Eksptl i Teoret Fiz 18 893-902 (1948) Oct (In Russian)

A computation is made of the effective cross section of pair formation by a photon in the field of an electron; exchange effects, lags, and spin interactions are taken into account. A detailed examination is made of the extreme relativistic case and of the case in which all of the particles have low energies after the collision. Decelerating radiation due to a collision of two electrons is discussed.

828 Periods of Motion in Periodic Orbits in the Equatorial Plane of a Magnetic Dipole by Antonio Romero Juárez Phys Rev 75 137-139 (1949) Jan 1

The differential equations of motion of an electrically charged particle in the equatorial plane of a magnetic dipole are solved and the period determined for periodic orbits. The results obtained are applied to the study of cosmic radiation. Tabulated data are given for the periods of electrons moving in the equatorial plane of the magnetic field of the earth.

829 Relativistic Quantum Mechanics and the Principle of Reciprocity by Max Born International Conference on Fundamental Particles and Low Temperatures Vol. I 14-21. London, Physical Society 1947

The principle of reciprocity, which is based on the symmetry of the fundamental laws of quantum mechanics with respect to space-time variables and momentum-energy variables, is expressed by stating that "all laws of physics have the same form in x-space and in p-space." It is suggested that this principle may be of value in further development of the quantum theory; in particular, the author notes that the future theory of coupled fields may lead to an eigenvalue equation, the solutions of which will determine directly the rest-masses (not the energies in a given Lorentz frame).

830 Relativistic Wave Equations for the Elementary Particles by H J Bhabha International Conference on Fundamental Particles and Low Temperatures Vol. I 22-36. London, Physical Society 1947

A scheme of relativistic equations for elementary particles of any integral or half-odd integral spin is given. On this scheme all elementary particles except those of spin 0, 1/2, and 1 must appear with several values of the rest mass which bear well-defined and simple numerical ratios to the lowest value. The analysis of the structure of the equations and the associated wave-functions is carried further than in the previous papers (Current Science 14 89 (1945); Revs Modern Physics 17 200 (1945); Proc Indian Acad Sci A21 241 (1945)). The theory can be quantized even in the presence of interaction with mathematical regor, but this quantization requires a special means of interpreting the formalism physically.

PHYSICS, THEORETICAL (continued)

831 Semi-Quantitative Calculation for the Radiation Spectrum for Electrons in a Circular Accelerator (Calcul Semi-Quantique du Spectre de Rayonnement dans un Accélérateur Circulaire, à Electrons) by A Abragam J Phys et Radium 9 143-146 (1948) Apr (In French)

The radiation of an electron in a circular accelerator has been studied using a semi-quantitative method. The results thus obtained agree with those obtained by the classical method, which would tend to justify the latter in cases where it might otherwise be subject to doubt.

832 A Study on Spinor Fields and Their Quantization (Etude sur les Champs Spinoriels et Leur Quantification) by Jules Géhéniau Acad roy Belg Mém Classe Sci 21 No.5 56p (1948) (In French)

Spinor fields of any order and type, in a Minkowsky space-time, are systematically studied, and a method is shown for extending the theory to a General-Relativity case. Such spinors are encountered when a multiplier is sought for the Lorentz transformations. After finding the system of solutions for the equations of the spinor field of order n, the quantic theory of such a field is introduced by establishing the corresponding commutation relations. It is found that these relations are invariant for the Lorentz transformations. A definition is given of the operator of a relativistic Hamiltonian.

833 Superquantization. II by H J Groenewold Koninkl Nederland Akad Wetenschap, Proc 51 1091-1103 (1948) Nov

The author continues his discussion of "superquantization" (Koninkl Nederland Akad Wetenschap, Proc 51 977-989 Oct (1948)). The relations between the ordinary quantization of classical particle theory, the quantization of classical field theory, and the superquantization of the ordinary quantum theory of particles are noted. The author indicates that all present quantum theories can, without a process of further quantization, be derived from the ordinary quantum theory of particles, the latter being equivalent to Dirac's theory (Proc Roy Soc London A180 1 (1942)). The older current theories can be obtained also if a "trick" operation which is characteristic for hole theories is performed.

834 The Thomas-Fermi Atom Deduced from a Variational Principle (L'Atome de Thomas-Fermi Déduit d'un Principe Variationnel) by G Allard J Phys et Radium 9 225-229 (1948) July-Aug-Sept (In French)

It is shown that the theory of Thomas-Fermi (Brillouin, L'atome de Thomas-Fermi et la méthode du champ "self consistent", No. 160 des Actualités Sci et Ind, Hermann and Co., editors, (1934)), including the limit conditions, may be obtained by assuming that the total energy of the atom is stationary. The potential energy is calculated by applying Coulomb's law and the kinetic energy by comparing the electronic "cloud" with a completely degenerate Fermi gas. The following expression for the total energy of ionization for an atom of atomic number "Z" is obtained; $W = -15.73\ Z^{7/3}$ eV which is verified for the light atoms, i.e., Z ranging from 1 to 8. The calculated and experimental values agree closely except in the case of hydrogen. Some interesting data are discussed in the light of Dirac's theory, based on the ideas of Fock, which takes the exchange forces into account to some extent.

RADIATION SICKNESS

835 Antihistamine Drugs and Radiation Sickness by W M Court Brown and R B Hunter Brit Med J No. 4587 984 (1948) Dec 4

"Anthisan," as the most potent and specific antihistamine drug available, was given to 10 patients in daily doses of 1 g and to 7 patients in daily doses of 0.6 g for 5 days before starting irradiation. Fifteen patients were given an inactive preparation, and 15 patients were given no preparation whatever prior to irradiation. Radiation sickness developed in 16 patients (94.1%) receiving "anthisan," in 10 patients (66.6%) receiving the inactive preparation, and in 11 patients (73.6%) receiving no preparation. "Anthisan" was found to be of no value in the treatment of radiation sickness and, furthermore, to produce erythema in some cases, and also to give rise to a profound constitutional upset. The patients used were those undergoing post-operative irradiation with X-rays for carcinoma of the breast. 11 references.

836 The Clinical Manifestations of Acute Radiation Illness Produced in Goats by Exposure to an Atomic Bomb, Test Able, Bikini, 1946, with Comments on Therapy by Eugene P Crankite. Naval Medical Research Institute Report No. 10 Mar 8 1948 42p (NP-574)

The clinical manifestations of acute ionizing radiation illness in the goat at which it progresses are functions of the amount of radiation received. The fully-developed illness consists of apathy, anorexia, diarrhea (often bloody), purpura, epilation, marked leukopenia, and a high mortality. However, many signs may be absent with overwhelming or sublethal radiation. The therapeutic use of penicillin and transfusions suggests that these agents may be of value.

837 A Critical Analysis of the Syndrome of Acute Total Body Radiation Illness, Its Role in Atomic Warfare and Its Influence on the Future Practice of Military Medicine by Eugene P Crankite and William H Chapman Military Surgeon 104 7-21 (1949) Jan

This analysis includes the following material. There is a clinical description of acute total body radiation illness based on bombing experiences at Hiroshima and Nagasaki and on accumulated experimental laboratory data. The pathogenesis of radiation illness is discussed primarily from the standpoint of the initial injury of sensitive cellular systems. The possible presence and influence of circulating toxins from injured tissues and the bowel is discussed. A program for the study and care of human radiation casualties under ideal conditions is outlined, and a general analysis of the therapeutic challenge that atomic warfare presents to military medicine is presented. It is concluded that investigation is urgently needed along many avenues to improve out understanding of this illness: such as (a) Information on the influence of diet and environmental factors on survival after exposure to doses in the lethal range is needed; (b) Information concerning the relationship of the adaptation syndrome and the pituitary-adrenocortical mechanism to radiation illness is desirable; (c) The role of autosensitization and anaphylactoid phenomena in radiation illness must be clarified. And in regard to defensive measures in the event of an atomic war, the most critical and practical needs today are these: (a) The development of an easily read dosimeter; (b) The continuation of basic and applied research along the lines discussed in this paper. 58 references.

838 The Diagnosis of Ionizing Radiation Injury by Physical Examination and Clinical Laboratory Procedures by Eugene P Crankite. Naval Medical Research Institute Report No. 8 Apr 8 1948 15p (NP-573)

The symptomatology and diagnosis of acute and chronic radiation illness is discussed. Characteristic symptoms of the acute illness are nausea, vomiting, diarrhea, hemorrhagic manifestations, agranulocytosis followed by non-purulent necrotizing infections, and epilation. The blood picture is the most sensitive biologic index of exposure to ionizing radiation. Lymphocytopenia appears promptly after the single intense exposure. The symptomatology and blood picture of chronic exposure is protean. In order to evaluate the blood changes of chronic exposure, rigid control data must be established. The most significant blood change following chronic exposure is a depression of the mean

RADIATION SICKNESS (continued)

leukocyte count of the exposed groups below the control groups. Dosimetry, the measurement of radiation intensities, must remain the basis of all protective measures.

839 Medical Aspects of Radiation Safety by Bernard S Wolf Nucleonics 3 No. 4 25-29 (1948) Oct

This brief discussion emphasizes what the author calls psychomatic aspects. He takes up the following five items in connection with radiation which seem most worrisome to people and attempts to place these special hazards in their proper prospective. They are (1) the inability to detect exposure through the five senses, (2) the penetrating power of radiation, (3) the delayed effects of overexposure, (4) the sterilizing effect, and (5) the genetic effect.

840 Reconstruction Following Irradiation Injuries by Paul W Greeley Archives of Surgery 56 741-749 (1948) June

Although present knowledge of X-ray and radium therapy is extensive, a surprisingly large number of irradiation injuries still occur. They result from incidental reactions following treatment of deep lesions and mismanagement by untrained or inexperienced operators. It is emphasized that all types of treatment by X-rays under disguised names and usually in the hands of lay operators are a serious menace to the public. X-rays produce irreversible reactions that are characterized by severe pain, itching, ulceration, and eventual malignant degeneration. These symptoms can be relieved promptly and permanently by wide surgical excision. The resulting defects are then closed by one of several different plastic surgical procedures. 8 figures.

RADIOACTIVITY

841 The Electrostatic Interaction and Low Energy Particles in Alpha-Radioactivity by Melvin A Preston Phys Rev 75 90-99 (1949) Jan 1

In α-decay, after the particle has been emitted, the asymmetrical electric field of the residual nucleus can cause the α-particle to alter its total energy in conjunction with a change in the state of the nucleus. Since the ability of a particle to penetrate the potential barrier increases rapidly with its energy, the number of particles of each possible energy finally escaping will not be in accord with the decay constants predicted by the Geiger-Nuttall law. It is found that the effect is not important (a quantitative estimate is given), except in the case where the difference between the energies of the two states is less than about 500 kev. The investigation allows a theoretical study of the experiments in which W Y Chang found anomalous fine structure in the α-spectra of Po and Ra. (Phys Rev 69 60 (1946) 70 632 (1946)). It is found that very improbable assumptions are required to reconcile these experimental results with the theory presented here, and the author is unable to see how any additional effects connected with the nucleus could alter this conclusion.

842 Evidence for a Complex Disintegration of I^{131} by George E Owen, David Moe and C Sharp Cook Phys Rev 74 1879-1880 (1948) Dec 15 (Letter to the editor)

The negatron spectrum of I^{131} obtained as a chemically separated decay product of Te^{131} has been studied in view of the discrepancy reported by Miskel (private communication) between the results obtained using two methods of determining the absolute disintegration rate of I^{131}. The negatron momentum distribution obtained using a semi-circular uniform field magnetic spectrometer, a thin-window G-M counter and sources of 0.18, 0.32, and 0.79 mg/cm^2 thickness contains conversion lines which have been associated with gamma energies of about 83, 163, 286, and 368 Kev. The data suggest that both sets of gammas, i.e., the high intensity (83 and 368 Kev) and the low intensity (163 and 286 Kev) gammas follow parallel transitions from a single excited state of Xe^{131} to its ground state. A Kurie plot is shown and the significance of the considerable rise above the extrapolated straight line portion indicated at low energies is discussed. Extrapolation of the higher energy data gave a maximum β-energy of 597 ± 5 Kev.

RADIOACTIVITY (continued)

843 Existence of a New Isotope of Radon: Rn^{218} (Sur l'existence d'un nouvel isotope du radon; le Rn^{218}) by Robert Walen Compt Rend 227 1090-1092 (1948) Nov 22 (In French)

This work is based on the observation made by Karlik and Bernert (Naturwissenschaften 31 298 (1943); Z Physik 123 51 (1944)) of a long range (55.3 mm) α-emission of RaA which these authors attributed to an element At^{218} formed from RaA by β-disintegration. The experiments of the present author lead to the identification, besides At^{218}, of an isotope of radon, Rn^{218}, the general scheme being

Rn
↓
RaA → At^{218} → Rn^{218}
↓ ↓ ↓
RaB → RaC → RaC′

(↓ = α-emission, → = β-emission). The ratio $\alpha Rn^{218}/\alpha RaA$ is of the order of 2.10^{-7}. The half-life period of the α-emission of Rn^{218} is 1.3 sec, that of At^{218} a few seconds (upper limit).

844 Experiments on the Effect of Atomic Electrons on the Decay Constant of Be^7 by E Segre and C E Wiegand Phys Rev 75 39-43 (1949) Jan 1

This article is based upon AECD-2199. An abstract of this document has been listed in Nuclear Science Abstracts as Abstract No. I-1028.

845 The Gamma-Ray Spectrum from $F^{19} + H^1$ Using Photographic Emulsions Containing D_2O by Gerson Goldhaber Phys Rev 74 1725-1726 (1948) Dec 1 (Letter to the editor)

Emulsions containing approximately 50% D_2O were exposed while wet to F^{19} $(p\alpha',\gamma)O^{16}$ gamma rays obtained by bombarding a thick CaF_2 target with 2.6-Mev protons from the Wisconsin electrostatic generator. A control emulsion which had been soaked in H_2O was also exposed. The range in wet emulsions (R_w) was converted to a range in dry emulsions (R_d) using the relation $R_d = 0.93\ R_w$; the range-energy relation of Lattes, Fowler, and Cuer (Proc Phys Soc (London) 59 883 (1947)) was then used for R_d. Histograms of the range distribution are shown for all tracks having an angle of dip less than 50°. The number of photo-proton tracks of length greater than 20μ is shown as a function of photo-proton energy. The data obtained agree with the recent results of Walker and McDaniel (Phys Rev 74 315 (1948)).

846 Gamma-Rays from Deuteron Reactions by David E Alburger Phys Rev 75 51-56 (1949) Jan 1

Gamma rays from Na, Mg, Al, Si, P, S, and PbO_2 targets under cyclotron bombardment by 3.7-Mev deuterons have been measured by coincidence absorption of Compton electrons. With PbO_2, Al, and Mg, Compton distributions were also obtained by means of a thin lens magnetic spectrometer. Correlation of several of the measured values can be made with excited states of N^{14}, O^{17}, and Si^{28} as obtained from other information. The predominant gamma rays have moderately large energy, being 8.8 Mev in one case, indicating a preference for direct transitions from states of high excitation to the ground state of the product nucleus.

847 Measurement of the Radioactive Decay Constant of ThC′ Using a Coincidence Method by F W Van Name Jr Phys Rev 75 100-103 (1949) Jan 1

The radioactive half-life of ThC′ has been measured using a delayed coincidence circuit of high resolution. A theory of the effect on the coincidence rate of variations in pulse formation in counters has been developed and compared with experimental results. The radioactive decay constants of ThC′ have been found to be: $T = (2.2 \pm 0.1) \times 10^{-7}$ sec; $\lambda = (3.15 \pm 0.14) \times 10^6$/sec.

RADIOACTIVITY (continued)

848 On the Formation of Isomers $_{52}Te^{127}$ with Periods 90 Days and 9.3 Hours from $_{51}Sb^{127}$ (93 Hours) Obtained by Uranium Fission (Sur la formation par fission de l'uranium des isomères $^{127}_{52}Te$ de périodes 90^j et 9^h, 3 à partir du $^{127}_{51}Sb$ 93^h) by Jacqueline Beydon Compt Rend 227 1159-1161 (1948) Nov 29 (In French)

The transformations

$$_{51}Sb^{127}(93\ h) \xrightarrow{\beta} {}_{52}Te^{127}\ (90\ d)$$
$$_{51}Sb^{127}(93\ h) \xrightarrow{\beta} {}_{52}Te^{127}\ (9.3\ h)$$

have been established by the work of several authors (Tape and Cork, Phys Rev 53, 676 (1938); Seaborg, Livingwood, and Kennedy, Phys Rev 55, 794 (1939); 57 363 (1940); Abelson, Phys Rev 55 876 (1939); 56 1 (1939); and table of fission products, J Amer Chem Soc 68 2411 (1946)). The present author studied them with the purpose of determining the ratio of the two disintegrations of $_{51}Sb^{127}$. This latter element was obtained by irradiating ammonium uranate in a cyclotron by slow neutrons. It was separated as SbH_3 by the action of H_2 (with 2 mg of $SbCl_3$ as carrier). After precipitation with $AgNO_3$, the product was converted into a chloride in a 3N HCl solution. From this solution Te was separated at several successive intervals of time by precipitating with hydrazine hydrochloride, and the activity of the precipitates measured. The analysis of the decay curves thus obtained gave for the ratio Te (9.3 h)/Te (90 d) a value of 5.2.

849 On Simultaneous Beta-Gamma Emission from Nuclei by Conrad L Longmire Phys Rev 75 15-17 (1949) Jan 1

The possibility of simultaneous beta-gamma-emission as an alternative process for strongly forbidden beta-decay is investigated. The lifetime of the compound transition is estimated, and the beta- and gamma-spectra are given. Combinations of spin and parity for which the compound transition would not be obscured by the ordinary beta transition are listed.

850 On the Theory of β-Disintegration in the Case of a Low Upper Limit of the β-Spectrum and on the Mass of Neutrino (Teoriya β-Raspada v Sluchae Nizkoĭ Verkhneĭ Granitsy β-Spektra i Massa Neĭtrino) by M A Markow Zhur Eksptl i Teoret Fiz 18 903-906 (1948) Oct (In Russian)

The β-disintegration is examined on the assumption of a non-zero mass of a neutrino. It is found that in those cases in which the upper limit of the β-spectrum is low the neutrino mass plays a different part in different theories of the β-disintegration. The properties of H^3 serve as an illustration of these results. (See Konopinski, Phys Rev 72 518 (1947).)

RADIOGRAPHY

851 Field Experience on Gamma Ray Inspection of Welds in a High Pressure Pipe Line by A B Lauderbaugh and S A Brosky Gas Age 102 No. 12 25-27 (1948) Dec 9

A field radiograph of gamma-ray inspection of welds along a pipe line was executed. The pictures were taken by attaching a strip of film in its holder to the outside of the weld on one side of the pipe, and a capsule of radium directly opposite the film on the other side of the pipe. With the help of expert interpretation, slag lines, tiny gas pockets, and lack of penetration are all quickly recognized. The results of 415 pictures of welds and the estimated cost of $5.00 per weld picture lead the authors to believe that field inspection of pipe line welds by means of gamma or X-ray will be an accepted part of pipe line construction.

RADIOGRAPHY (continued)

852 An Investigation of Radiography in the Range from 0.5 to 2.5 Million Volts by W. W. Buechner, R J Van de Graaff, H Feshbach, E A Burrill, A Sperduto and L R McIntosh ASTM Bull No. 155 54-64 (1948) Dec (TP262)

An investigation of radiography in the 0.5-2.5 Mev range is presented in detail. The production, scattering, and absorption of high-voltage X-rays are discussed, and the technique of high-voltage radiography is treated at some length. The data are presented in numerous curves and several apparatus diagrams are shown. 21 figures and 16 references.

RADIOTHERAPY

853 An Evaluation of the Use of Beta Rays in Ophthalmology by James I Moore Southern Med J 41 1092-1094 (1948) Dec

This paper summarizes the results of 9 years work in the Radium Clinic of the Wilmer Institute of the Johns Hopkins Hospital. Beta-ray therapy may be considered the treatment of choice in the following conditions: vernal conjunctivitis, vascularization of the cornea following corneal ulcers, chemical burns, trauma, or keratitis. The following conditions while successfully treated with β-rays may also be treated with other types of therapy: pterygia, papillomata, granulation tissue of lids and globe, and keloids. Among conditions that are not helped by β-ray therapy are corneal dystrophies, dense old corneal scars without vascularization, dark pigmented moles of the lids, sebaceous cysts, chalazions, and xanthelasma.

854 New Developments in Irradiation Therapy of Cancer of the Uterine Cervix by Charles L Martin Texas State J Med 44 587-593 (1948) Dec

During recent years irradiation techniques have been improved so that the five-year salvage rate for cancer of the cervix lies between 35 and 40 per cent of all the cases treated. Although many radiologist believe that such a high salvage necessitates a high incidence of irradiation sequelae, techniques which have yielded an absolute five-year salvage of 38.6 per cent without the production of serious irradiation sequelae are presented in this paper. 7 references, 7 tables, and 4 figures.

855 Proceedings of the Central Society for Clinical Research Twenty-First Annual Meeting J Lab and Clin Med 33 1606-1654 (1948) Dec

The following papers were presented at the 21st annual meeting of the Central Society for Clinical Research, which met in Chicago, Ill., October 29 and 30, 1948: Berylliosis: Observations and Report of Clinical Study of Seventy Cases of Chronic Disease, by Willard Machle; The Effect of Varying the Dose of Iodine on the Behavior of Radioiodine Tracers in Patients with Exophthalmic Goiter, by D. S. Childs, Jr., F. R. Keating, Jr., and M. H. Power; The Use of Radioarsenic (As^{76}) in the Treatment of Leucemia and Allied Disorders of the Hematopoietic Tissues, by Matthew H. Block, Leon O. Jacobson, William B. Neal, Jr., and Taylor R. Smith. Abstracts of these papers are found on pages 1613, 1615, and 1649, respectively.

856 Radioactive Isotopes (Isotopes Radiactivos) by Domingo Pescuma La Semana Médica 55 932-934 (1948) Oct 28 (In Spanish)

This article very briefly covers various investigations on the therapeutic use of radioactive isotopes. There are comments on therapeutic administration, and various dosages are given for radioactive phosphorus in myelogenic leukemia, lymphatic leukemia and lymphosarcoma.

857 Radioactive Phosphorus in the Treatment of Polycythemia Vera by Harold B Spangler J Bowman Gray School Med 6 206-207 (1948) Dec

According to this review the effectiveness of P^{32} as a therapeutic agent in polycythemia vera is well established, but this type of treatment is in no way curative. It appears to be superior to other methods of treatment but must be carefully controlled to prevent leukopenia, thrombocytopenia, anemia, and irreversible damage to bone marrow. The following topics are briefly presented: preparation and

RADIOTHERAPY (continued)

properties of P^{32}, metabolism and excretion of P^{32} in the human body, general therapeutic procedure, and clinical and hematologic response to therapy. 28 references.

858 Recent Advances in the Treatment of Lyphomas and Leukemias by Lloyd Freeman Craver Cincinnati Journal of Medicine 29 671-679 (1948) Dec

Both chemotherapeutic and radiotherapeutic advances are discussed in this paper. There has been improvement in palliative results in Hodgkin's disease, lymphosarcoma, and chronic lymphatic leukemia with regard to both symptoms and survival time. This has been the result of greater precision in detection of lesions and greater precision in their treatment. Also contributing have been the additional methods of palliation by means of the nitrogen mustards for Hodgkin's disease and some cases of lymphosarcoma and leukemia; by means of urethane for some cases of leukemia; by means of radioactive isotopes, such as phosphorus or sodium, in some cases of leukemia, polycythemia vera, and a few cases of lymphosarcoma; and perhaps with stilbamidine for multiple myeloma. What seems promising is first the possibility of cure of early Hodgkin's disease and some cases of early lymphosarcoma, either by obliterative roentgen therapy or surgery in suitable cases, probably best followed by irradiation. Secondly, a more specific attack may be offered by suitable modifications of radioactive isotopes, or perhaps by the discovery of more specifically acting chemotherapeutic agents some time in the future.

859 The Role of Radiotherapy in the Treatment of Malignant Disease by Maxwell Evans Bull Vancouver Med Assoc 15 10-14 (1948) Oct

In this discussion of radium and X-rays as the therapeutic agents, many phases of the subject are touched upon. For the most part, each is limited to one or two sentences.

860 Thrombocytopenic Purpura Following Therapeutic Administration of Radioactive Sodium by Harold W Jacox Radiology 51 860-861 (1948) Dec

Thrombocytopenia purpura developed following therapeutic administration of radioactive sodium in a case of metastic sympathicoblastoma. During a 5-month period of total of 202 millicuries of radiosodium (285 r) were administered to a 21-year-old male. Pain was alleviated and repeated blood counts showed no abnormalities until after the last treatment when hemorrhagic manifestations appeared. The number of platelets fell rapidly but all the other blood elements continued to be normal. Death was attributed to aplastic anemia. An autopsy revealed punctate hemorrhages everywhere, clotted blood in the pelvis of the left kidney, and hemosiderosis in the spleen and bone marrow. In this case the purpura was caused by the radiosodium and not the disease itself. Although other patients have received much more radiosodium without a similar reaction, this patient seemed to become more susceptible to succeeding treatments.

861 Treatment of Asthma by Radiotherapy (Results for 680 Cases) (Traitement de l'Asthume par la Radiothérapie (D'après une statistique de 680 cas suivis)) by Pasteur Vallery-Radot and Pierre Blamoutier Presse Méd 56 813-814 (1948) Nov 20 (In French)

The results of 23 years of study on the effect of radiotherapy in asthma and its respiratory equivalents (spasmodic coryza and cough) indicate that it is not to be considered a specific treatment, but rather only the most effective of all treatments for asthma. Although irradiation of the lungs is most effective in treating bronchial asthma, splenic radiotherapy is efficacious in treating spasmodic coryza. From this it seems probable to the authors that X-rays produce humoral modifications that have an effect on the asthmatic state. The various dosages are given as ranging from 150 r to 200 r per appointment. Some patients received as much as 18,000 r in 110 appointments. Of over 1000 cases treated 680 were followed up. The results are summed up as follows: 23% very satisfactory, 18% notable improvement, 23% transient or incomplete improvement, 36% complete failure.

RADIOTHERAPY (continued)

862 The Treatment of Malignant Disease by Radium and X rays, being a Practice of Radiotherapy by Ralston Paterson London, Edward Arnold 1948 662p and 6 graphs

This book is called "the most important book on radiotherapy yet published". Although dealing with controversial issues the necessity for basic principles and a working hypothesis is kept in mind, and for the sake of clarity and definiteness the presentation is dogmatic. Physics is included only in so far as its practical applications in treatment and in the assessment of dosage are concerned. The first three chapters state the particular principles on which are based the methods described in subsequent pages. There follow in orderly sequence descriptions on Armamentarium, Calibration of Plant and Choice of Operating Factors and Planning and Prescription, with W. J. Meredith; Beam Direction by J. L. Dobbie; Radium Dosage, Construction of Moulds and Reaction to Radiation. Then follows an account of the methods used in practical therapy by radium and X-rays for malignant disease in various sites. The book ends with six chapters on Causes of Failure in Treatment; Teleradium Therapy, by Professors B. W. Windeyer and J. E. Roberts; Protection Organisation and Records; Biological Action, by Edith Paterson; and lastly, New Radiotherapeutic Agents.

RARE EARTHS AND COMPOUNDS

863 The K Spectra of Element 61 by L E Burkhart, W F Peed and E J Spitzer Phys Rev 75 86-89 (1949) Jan 1

This article is based on AECD-2107. An abstract of this document has been listed in Nuclear Science Abstracts as abstract No. I-702.

864 Observations on the Rare Earths: I. Ion Exchange Studies on Thorium-Rare Earth Mixtures II X-Ray Diffraction Studies on Certain Rare Earth Salts by Authur Ralph Matheson Urbana, Illinois, University of Illinois (1948) 4p (Abstract of a thesis)

The author has studied the separation of thorium and neodymium ions by passing solutions of thorium nitrate and neodymium chloride and mixtures of these two solutions through beds of Amberlite IR-100H contained in glass tubes.

The following eluting agents were investigated: .5, 5, and 10% hydrochloric acid solutions; 5 and 10% citric acid solutions; saturated ammonium oxalate solutions; saturated ammonium carbonate solutions; 5% ammonium chloride solution; 5% ammonium acetate solution; and 5% acetylacetone solution. It was found that all except ammonium chloride, ammonium acetate, and acetylacetone solutions elute thorium to some extent and that ammonium oxalate and ammonium carbonate solutions do not elute neodymium. Since materials like citric acid elute both ions, only certain agents could be used. Separation of neodymium from thorium was effected by using .5 and 5% hydrochloric acid solutions, in the pH range 2.60-2.88, while thorium was separated from neodymium by using saturated ammonium carbonate solutions, pH 8.56, and saturated ammonium oxalate solutions, pH 5.15, 6.28, and 8.70.

For separate elution, it was necessary to change to another eluting agent after one species of ions had been eluted. The elution of the thorium ions was never complete, and it is possible that the thorium is bound in the interior of the resin particle or molecule by a coordinate linkage.

Part II. A brief discussion of the crystal structures of the rare earth elements, oxides, and halides is given, and a list compiled of those rare earth elements and compounds whose crystal structures have been determined, together with references. The author also prepared powder patterns for neodymium bromate ennea-hydrate, neodymium sulfate octa-hydrate, and praseodymium, neodymium, and thorium acetylacetonates. Praseodymium and neodymium acetylacetonates are isomorphous. The crystal structure of neodymium acetylacetonate was determined and found to be monoclinic, with four molecules per unit cell.

RARE EARTHS AND COMPOUNDS (continued)

865 The Preparation of Cerium Oxides for Glass Polishing (La Préparation de l'Oxyde de Cérium Employé pour le Polissage des Verres) Génie Civil 125 436 (1948) Nov 15 (In French)

This paper is a review of the article by R. W. Urie and A. W. Wylie (Engineering 166, p. 189-190, August 20, 1948), in which the preparation of rare earth oxides is described. Monazite is the starting material.

SCIENTIFIC RESEARCH AND LABORATORIES

866 Isotopes for Medicine by Paul C Aebersold J Amer Med Assoc 138 1222-1225 (1948) Dec 25

After a brief generalization of the subject the following data on the distribution of pile-produced isotopes between August 2, 1946 and May 30, 1948 are given. The total number of shipments are (1) for studies in animal and human physiology and medical therapy — 2,103; (2) for all fields of study — 2,901; and (3) for all fields now over 200 per month. The number of institutions using isotopes are (1) for P32 in medical therapy — 43; (2) for I^{131} in medical therapy — 38; (3) for radioisotopes in medicine and biologic studies — 119; and (4) for radioisotopes in all fields of study — 229. The number of individual projects is (1) in medicine and biologic studies — over 700; and (2) in all fields of study — over 1,400. Illustrations of the uses in medicine, physiology, and pharmacology to which the isotopes are put are given for I^{131}, P^{32}, C^{14}, S^{35}, and Ca^{45}.

867 New Zealand Nucleonics Forecast 10 533 (1948) Dec

A nuclear physics section of the New Zealand Department of Scientific and Industrial Research has been set up and will concentrate on instrumentation problems concerned with the application of radioactive isotopes to biological and medical problems.

868 Research and the Development of Atomic Energy by Robert F Bacher Science 109 2-7 (1949) Jan 7

The various research trends in the divisions administreed by the U. S. Atomic Energy Commission, i.e., the Division of Production, the Division of Military Application, the Research Divisions (physical sciences and biological and medical sciences) and the Division of Reactor Development, are described in an address delivered at the November 18, 1948 meeting of the Washington, D. C. Academy of Sciences by the author, who is a member of the Atomic Energy Commission.

SPECTROSCOPY

869 The Continuous Absorption Coefficient of the Helium Atom by Su-Shu Huang Astrophys J 108 354-372 (1948) Nov

In this paper the continuous absorption coefficient of He I beyond the series limits 504.3 A, 2600.7 A, and 3122 A (i.e., transitions from the ground state 1^1S and the two metastable states 2^3S and 2^1S to the continuum) are investigated. For the bound states, wave functions derived from the Ritz principle were used, while for the free states Coulomb wave functions with an effective charge of 1 were used. With these wave functions the continuous absorption cross-sections have been derived from the matrix elements not only of the dipole moment but also of the momentum and of the acceleration. The agreement of values derived from the momentum and the dipole moment provides a strong confirmation of the results obtained from them. However, the cross-sections derived from the acceleration are much smaller. This last circumstance is due to the fact that the main contribution to the matrix elements of the acceleration comes from very near the origin, where an effective charge of 1 is unsuitable. The integrated f-values for the three continua have also been computed. When these f-values for the continua are added to the respective sums for the discrete states evaluated by other authors, it is found that the f-sum rule is approximately satisfied. This is an additional check on the calculation.

SPECTROSCOPY (continued)

870 Radiative X-Ray Transition within the L Shell of Sulfur by D H Tomboulian Phys Rev 74 1887 (1948) (Letter to the editor)

Further verification of the occurrence of radiative X-ray transitions within the L shell of an atom is presented. The possibility that such a transition takes place has been suggested to explain the absence of the L_I emission band in elements where the L_{II} and L_{III} emission bands have been observed. A line of 1.5 Kev width with its peak at 203 A has been observed on spectrograms obtained using a target containing sulfur. This is in excellent agreement with the previous prediction (Tomboulian and Cady, Phys Rev 59 422 (1941)) of the wave-length of the $L_I \rightarrow L_{II}, L_{III}$ radiative transition of sulfur. The peak wave-lengths of the $L_I \rightarrow L_{III}$, L_{II} transitions observed to date lie at 375, 317, 290, and 203 A for Na, Mg, Al, and S, respectively. Radiationless $L_I \rightarrow L_{III}$ transitions which are energetically possible must play a prominent role in further weakening of the soft X-ray emission bands involving L_I as the initial state.

871 Utilization of Electron Multiplier Cells in Raman Spectrography. Part I (Utilisation des Cellules Multiplicateurs d'Electrons en Spectrographie Raman. I) by Per-Olof Kinell and Philippe Traynard Acta Chem Scand 2 193-203 (1948) (In French)

The authors give the principal characteristics of electron multiplier cells and present a Raman spectrograph where these cells were used as the receiver. The arrangement was such that the entire range of the spectrum could be studied. With convenient amplification, the photoelectric currents enable the authors to obtain spectrograms on which intensities may be measured within approximately 2%. Schematic diagrams, a Raman spectrum, and a bibliography with 16 references are presented.

872 Utilization of Isotopes in Infrared and Raman Spectroscopy by Marc de Hemptinne J Phys et Radium 9 180-183 (1948)

The value of substituting atoms in a compound by their isotopes can be applied to making difficult identifications in the infrared and Raman spectra and is also useful in choosing between equally plausible structures. In some cases such a substitution may stimulate activity of spectral lines normally forbidden. Illustrations are found in the deuterio-substituted vinyl bromides and ethylene dibromides, and in the Swan bands of C_2 emitted by methane containing a high concentration of $C^{13}H_4$.

TRACER APPLICATIONS - BIOLOGY

873 Applications of Atomic Energy in Medical Research by Titus C Evans Trans Amer Acad Ophthalmol and Otol 88-96 (1948) Nov-Dec

Atomic energy, in the form of radiation from radioisotopes has provided medicine with a tool whereby certain elements and compounds may be followed through physiologic processes of vital importance in the study of body functions. It has produced several aids in diagnosis and it offers hope of improving therapy of neoplasia and other diseases. It has also made physicians in general more aware of the necessity of avoiding excessive exposure to ionizing radiation and of studying means of treatment in case such overexposure may unavoidably or accidentally take place in the future. 59 references.

874 The Function of the Gastric Mucosa. Experimental Researches with Radioactive Bromine (Die Funktion der Magenschleimhaut. Experimentelle Untersuchungen mit radioaktiven Brom) by Elemér Gabrieli Acta Physiol Scand 16 Supplement 53 (VI Scandinavian Physiological Congress, Oslo 15-18 Aug 1948, Abstracts of Communications) 25 (1948) (In German)

The long known facts that bromine circulating in the blood as hydrogen bromide appears in the gastric juice and that bromine can substitute freely for chlorine in hydrochloric acid were examined. Fistulas were constructed in cats' stomachs and the cardia and the pylorus tied off. Radioactive bromine as sodium bromide in physiological solution was injected intravenously. After 30-50 min 1.0 mg of histamine was given subcutaneously and the gastric juice drawn off completely every 15 min.

TRACER APPLICATIONS - BIOLOGY

In 14 experiments it was observed that a relation exists between activity and hydrochloric acid concentration. With the increase of hydrochloric acid concentration following histamine injection there was a simultaneous decrease in the Geiger count. Later as the acid concentration decreased, activity increased. It was found that with a faster rate of secretion there was relatively more hydrochloric acid than bromine secreted. From this it was concluded that the bromine substitution for chlorine in the secretion of gastric juice is not complete; rather this relation is a function of the rate of secretion.

875 Interpretation of Experiments on Metabolic Processes, Using Isotopic Tracer Elements by A G Ogston Nature 162 963 (1948) Dec 18

Two instances (Wood, Werkman, Hemingway, and Nier, J Biol Chem 139 483 (1941); Shemin J Biol Chem 162 297 (1946)) are mentioned in which the distribution of isotopic carbon in the product of a metabolic process has been used to infer that a symmetrical intermediate compound is not involved. The author sees these conclusions arising from the fallacy that, because symmetrical products resulting from the D- or L-form of an optically active precursor cannot be distinguished, the two identical groups of a symmetrical product formed from one optical antipode cannot be distinguised. However, asymmetric enzymes attacking symmetrical compounds can distinguish between its identical groups. It appears that the asymmetrical occurrence of an isotope in a product cannot be taken as conclusive evidence against its arising from a symmetrical forerunner.

876 Localization of Brain Tumors with Radiodyes Part 1. Chemical and Physical Aspects The Synthesis of Diiodo^{131} Fluorescein by Gerald Boyack, George E Moore and Donald F Clausen Nucleonics 3 No. 4 62-63 (1948) Oct

A detailed method for preparing diiodo^{131} fluorescein is given. This dye has been found to localize in tumor tissue in a concentration as high as 17 times that in normal brain.

877 Localization of Brain Tumors with Radiodyes. Part 2. Experimental Evaluation of the Physical Limitations by James F Marvin and George E Moore Nucleonics 3 No. 4 63-68 (1948) Oct

Data are presented from four experiments with water phantoms containing radioactive iodine. Calculations are presented on the idealized flat phantom which are well checked by the experimental data. The following conclusions are made. (1) Brain tumors which retain a concentration of radioactive diiodofluorescein twice that of the surrounding brain tissue can be detected with the Geiger counter provided that the tumor volume exceeds 20 cc and approaches 40 cc. (2) Total counts taken must be adequate to lower the statistical fluctuation in the counting rate to a fraction of the 15 to 20% increase in count expected due to the tumor. (3) The method of symmetrical counting positions used by Moore (Science 107 569 (1948)) proved adequate in the phantom experiment. Maintaining the counter normal to the skull seems to be the best procedure. (4) Use of a defining cone or the method of taking counts with or without a lead mask gives equally good results. A tapered cone is not of value.

878 Oxidation of Parenterally Administered C^{14}-labeled Tripalmitin Emulsions by S R Lerner, I L Chaikoff, C Entenman and W G Dauben Science 109 13 (1949) Jan 7

Radioactive carbon was used as a direct method for determining whether an animal can convert parenterally administered fatty acids to CO_2. It is concluded that emulsified fat introduced directly into the blood stream is available for caloric purposes and follows a normal metabolic course.

879 Radioisotopes in Nutritional Trace Element Studies — II by C L Comar Nucleonics 3 No. 4 30-42 (1948) Oct

This paper deals with the trace elements cobalt and manganese, and presents techniques for the study of their metabolism in animals along with a review of results to date. 5 tables. 34 references.

TRACER APPLICATIONS - BIOLOGY (continued)

880 Review of Conventions in Radiotracer Studies by John Schulman Jr and Marlene Falkenheim Nucleonics 3 No. 4 13-23 (1948) Oct

The methods used in the literature for expressing experimental results with radioactive isotopes are indicated and discussed. Constants of proportionality are calculated for reducing results in different ways to the same terms for purposes of comparison, and suggestions for future usage are given. 2 tables and 155 references.

881 Some Uses of the Artificial Radioactive Elements for Investigation and Treatment by R Kaye Scott Med J Australia 2 539-545 (1948) Nov 6

This is a compact summary of the following: (1) preparation and form of isotopes, (2) fate and metabolism of the isotopes, (3) tracer studies with isotopes, (4) therapeutic uses of the isotopes, and (5) handling and administration of isotopes.

882 A Study of Phosphorus Uptake in the Rat Tooth by Radioactive Tracer Techniques by Catherine J Hurley and John E Christian J Amer Pharm Assoc (Scientific Edition) 37 520-522 (1948) Dec

The purpose of this study was to determine the rate of uptake of phosphate in rats' teeth on intraperitoneal injection of phosphate and to determine the phosphate activity necessary to incorporate sufficient activity in the teeth for phosporus depletion studies. The results indicate that the most economical, rapid, and efficient method for obtaining rat teeth containing sufficient radioactive phosphorus to insure at least 35 counts per minute per mg (as measured in a 15-mm cup 1.5 cm from an Eck and Krebs counter tube) is to inject 250-Gm rats intraperitoneally with 1 cc of a radioactive potassium biphosphate solution containing 0.1 mg per cc and having an activity of between 5 and 7 million counts per minute per cc, and remove the teeth 20 hours after injection. Teeth containing an activity of at least 35 counts per minute per mg have been shown to be satisfactory for studies involving the phosphorus depletion of teeth. 20 references 2 tables.

883 Tracer Studies on the Role of Acetic Acid and Carbon Dioxide in the Fermentation of Lactate by Clostridium Lacto-Acetophilum by J V Bhat and H A Barker J Bact 56 777-779 (1948) Dec

By the use of C^{14} it has been shown that the bacteria in enrichment cultures of Clostridium lacto-acetophilum use carbon dioxide as an oxidant, converting it into acetic and butyric acids. In pure culture this organism is unable to reduce carbon dioxide, but it oxidized lactate to acetate and carbon dioxide and then converts the acetate to butyrate.

884 Translocation Studies in Tomato Using Ammonium Sulfate Labeled with N^{15} by Robert MacVicar and R H Burris Amer J Botany 35 567-570 (1948) Nov

The absorption and translocation of ammonium nitrogen by tomato plants has been investigated using ammonium sulfate labeled with N^{15}. Rapid absorption and translocation to the aerial portions of the plant occurred. The quantity of N^{15} in the sample was obtained using a mass spectrometer of the Nier type. The rapid initial increase in the concentration of labeled nitrogen to a maximum in more mature tissues suggests the conversion of the absorbed ammonium ion to organic nitrogenous compounds and the transfer of such compounds to other and more rapidly metabolizing portions of the plant; however, the possibility of direct translocation of ammonium ions and synthesis in situ is not excluded as an explanation of the observations. 2 tables, 12 references.

TRACER APPLICATIONS - INDUSTRY

885 Atomic Research May Solve Important Oil Problems by Thorfin R Hogness World Oil 128 No. 8 42-47 (1948) Dec

After a fundamental discussion of atomic structure, the author discusses the part radioactive tracers can play in the oil industry. The estimation of porosity and water and oil contents of strata,

TRACER APPLICATIONS - INDUSTRY (continued)

the tracing courses of subterranean oil pools, the tracing of catalytic processes, the studies of explosions, corrosion, lubrication, and desulfurization are all aided by the use of tracers. The author suggests that the best way for industry to get the advantages of advances in atomic sciences is to join cooperative plans at universities. The $12 million atomic and metal research program at the University of Chicago is a typical example of such a cooperative enterprise.

886 Isotopes and Industry (Les isotopes et l'industrie) La Nature No. 3164 364 (1948) Dec (In French)

Some of the many industrial applications of radioactive isotopes are discussed briefly; in particular, a number of applications to the study of complex organic molecules and metallurgical problems are mentioned.

887 Radioisotopes for Industry by A P Schreiber Electronics 22 90-95 (1949) Jan

Some of the applications of "tagged-atoms" in the following fields are discussed: separation of rare gases, precision physical measurements of factory products, textile dyeing control, rayon manufacture by the viscose process, indication of liquid level of tanks, air and stream pollution measurements, improving oil well recovery, locating survey stakes, and metallurgical research.

TRANSURANIC ELEMENTS

888 The First Isolation of Element 93 in Pure Compounds and a Determination of the Half-life of $_{93}Np^{237}$ by L B Magnusson and T J LaChapelle J Amer Chem 70 3534-3538 (1948) Nov

This article is based upon AECD-2179. An abstract of the document has been listed in Nuclear Science Abstracts as Abstract No. I-1064.

889 The Preparation of Solid Neptunium Compounds by Sherman Fried and Norman Davidson J Amer Chem Soc 70 3539-3547 (1948) Nov

This article is based on MDDC-1332. An abstract of this document has been listed in Abstracts of Declassified Documents 1 728 (1947) Dec 20.

URANIUM AND URANIUM COMPOUNDS

890 Classification of the Electronic Bands of Uranyl Salts Starting with the Infrared and Raman Frequencies of the Ion UO_2^{++} (Classification des Bandes Électroniques des Sels d'Uranyle a Partir des Fréquences Infrarouge et Raman de l'Ion UO_2^{++}) by Marie Freymann J Phys et Radium 9 158-160 (1948) May (In French)

Starting with the three frequencies 210, 860, and 930 cm^{-1} and their combinations 40 of the fluorescence lines and 40 of the absorption lines of hydrated uranyl acetate have been classified. The existence of two closely adjacent levels, separated by approximately 30 cm^{-1} was observed. This is perhaps related to the splitting into two lines in the 197-226 cm^{-1} region observed in the Raman effect and perhaps due, either to the Stark effect produced by the crystalline electric field, or more probably, to a vibration frequency from the rotation of the crystalline system.

891 Isotope Shifts in Uranium Spectra by L E Burkhart, George Stukenbroeker and Sam Adams Phys Rev 75 83-85 (1949) Jan 1

This article is based on AECD-2001. An abstract of this document has appeared in Abstracts of Declassified Documents 2 332 (1948) June 30.

892 Radiations of Uranium Y by G B Knight and R L Macklin Phys Rev 75 34-38 (1949) Jan 1

This article is based on AECD-1880. An abstract of this document has been listed in Abstracts of Declassified Documents 2 275 (1948) May 15.